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THE SLIME MOLDS OF OHIO

PROF. E. L. FULLMER
Baldwin Wallace College

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Published by
THE OHIO STATE UNIVERSITY
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1 O B S

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THE SLIME MOLDS OF OHIO

By

E. L. FULLMER

INTRODUCTION

The Slime Molds comprise about 400 species. Of these some 200 have been collected in the U. S. and about 150 have been found in Ohio. Every wood lot affords a number of species. The writer has collected 64 species from an area of land of less than a quarter section at Cedar Point, Ohio. These 64 species were obtained by spending a few days each summer for a period of years in careful search for specimens. Not more than 30 species were seen during any one season, but each seasons collecting resulted in species being found that were not seen before in that area. Doubtless the number found in this small area could be extended by further careful collecting.

In their development, Slime Molds pass through two very different stages, a vegetative, consisting of motile amoeba like cells, and a reproductive, consisting of spores which are usually found in sporangia. If a spore chances to fall in a favorable place it will germinate. In germinating the dense spore wall is ruptured and the protoplasmic contents escapes as an amoeba like cell and having an amoeboid movement. In the case of the Myxomycetae the amoeba like cell soon develops a flagellum or whip like projection, and by the lashing of this the cell is now propelled in a dancing or very jerky manner. (Plate X, figs. 1, 2, and 3.) These cells multiply rapidly in number and after a time a large number of cells, having lost their flagella, coalesce into a network, the plasmodium. The cells of the plasmodium are destitute of cell walls but the merging cells retain their nuclei and continue to increase in number by division. Plasmodia may often be found under the damp bark of old logs or upon other decaying organic matter that is moist and that is not exposed to the light. In color they are commonly yellow but some forms are white, others cream colored, still others red. They consist of a slimy reticulated mass and have a peculiar motion. (Plate X, figs. 4, 4a, and 4b). The substance of any one branch will flow in one direction for a brief time, stop and then flow in the opposite direction for a short time, however, flowing a little farther in the one direction than in the other and thus giving the plasmodium a forward movement. It may thus creep about upon and within a substance upon which it is feeding. It may even be induced to creep upon a glass slide and it may then be examined with a microscope and the movement studied.

Slime Molds feed upon organic matter. In some cases they use organic matter that is in solution while in other cases they ingest solid particles as small bits of wood, bacteria, etc. These are digested much as similar materials are by an amoeba. They are always destitute of chilorophyll and hence cannot produce food by photosynthesis.

If a plasmodium slowly dries out it may pass into a dormant condition called a sclerotium. It may remain in this condition for months when on being placed under favorable conditions again it will renew its activities.

When a plasmodium approaches maturity it generally leaves the moist hidden recesses where it has developed and comes out upon the surface of a log or may even creep up the stem of a plant for a distance of several inches, where the sporangia are formed. A typical sporangium may be illustrated by Plate X, fig. 5. In this we see the globular sporangium enclosed by the sporangium wall or peridium. The peridium may be single or double. Sporangia may be sessile or elevated upon a stalk; they may be separate or many gathered together into a compound mass called an aethalium as in Fuligo. Within the sporangium wall are found the spores and usually a capillitium, consisting of threads which may be simple or branched, free or attached to the sporangium wall. These threads are often beautifully sculptured and are largely used in the classification of the genera. The capillitium, sporangium wall, and stalk are wholly destitute of cellular structure, the substance of these being secreted by the plasmodium just prior to spore formation. In some genera, also, lime is secreted. This may be deposited within the capillitium as in Physarum, or in the stalk as in Diachaea, or upon the surface of the sporangium as in Diderma.

In size the forms differ from an aethalium as large as a man's hand to sporangia so small that they are not likely to be detected unless one chances to find them while examining sticks, bark, or other objects with a hand lens. Specimens may be found on the surface of fallen logs, under bark, on decaying leaves or straw, on stems of herbaceous plants either dead or living, or even on the ground. Sporangia, as a rule, are produced during the summer season but may in certain forms be produced in late fall or early winter. The sporangia of the most of the forms are evanescent but some forms that fruit under the bark of logs may be collected at any time of the year, while forms as Lycogala with a tough sporangium wall may endure weathering for several months even when fully exposed as when found upon a stump or log. Some species of Slime Molds exhibit considerable variation in size, shape, color, or sculpturing. At times spores of twice the normal diameter are found among those of normal size. Sometimes the capillitium varies much from the normal in its abundance, branching, or sculpturing, Stalked, sessile, or plasmodiocarpous forms of the same species may sometimes be found in the same

gathering. Sporangia that form late in the season under unfavorable conditions are more likely to have some part abnormal.

In distribution, some forms are cosmopolitan, others are very much restricted in range or in habitat as Arcyria globosa Schwein, which is never found except growing on the burrs, flowers, or leaves of the Chestnut and hence is restricted to localities in which the required food is obtained.

There has been considerable discussion as to whether the Slime Molds should be considered plants or animals, although they are more often discussed in botanical than in zoological texts. If the dormant asexual spores with their cellulose walls and the sessile or stalked sporangia are considered, one is inclined to view the group as a group of plants but when one observes a spore escaping from its wall, moving about, and taking food, often of solid particles, one sees clearly that the organisms have characters which ally them with some of the one celled animals. Perhaps the best way to think of this relationship is not to attempt to separate sharply the animal from the vegetable kingdom among the low forms of life but rather to recognize that the two kingdoms merge together and that there is a border land uniting the two kingdoms, the organisms in this border land having some characteristics of plants and other characteristics of animals. In some forms the animal characters predominate while in others the plant characters predominate and we then call them respectively animals or plants. However, when as in the Slime Molds, the animal and plant characters are about of equal prominence it may be best to simply regard the group as a generalized one that has developed a somewhat complex life history, some stages of which are animal like, others plant like.

Aside from the few species of the Plasmodiophoreae the Slime Molds are of no known economic importance. Since they secure their food from dead organic matter they must have some effect on the rapidity of decay. However, sometimes a plasmodium will creep upon a small living plant such as a fern or grass plant and by smothering kill it.

For herbarium material bits of bark, wood, straw, or other objects upon which the sporangia are found should be carefully collected and carried to the laboratory where they may be glued to the bottom of small boxes. Material thus preserved will keep almost indefinitely if not attacked by insects. Since the specific characters are often determined by the surface markings on the spores a microscope fitted with an oil immersion objective is essential for the accurate determination of some species. The determination of the genera can usually be made with the ordinary objectives.

The author is indebted to Dr. Herbert Osborn and Prof. John H. Schaffner for many helpful suggestions. He also is under obligations to Prof. Bruce Fink, Oxford, O.; Prof. F. O. Grover, Oberlin, O.; Dr. O. E. Jennings, Pittsburg, Pa.; and Mr. C. G. Lloyd, Cincinnati, O.; for the loan of

herbarium specimens. The most of the drawings are original. A very few of the figures are copied from Lister's Mycetozoa, and from Macbride's North American Slime-Molds. These are acknowledged in their appropriate place. The author prepared outline drawings of the spores and threads of the capillitium using the camera lucida, after which Miss Ruth Fullmer completed the drawings and prepared the plates under the author's direction.

THE MYXOPHYTA

Simple plants destitute of chlorophyll. The few species of the Plasmodiophoreae live parasitically in the cells of the host, all others are saprophytes. The vegetative stage consists of a mass of naked cells called a plasmodium. At maturity the plasmodium produces a large number of spores.

GENERAL KEY TO THE CLASSES, ORDERS, AND FAMILIES

A. Parasitic; spores in masses in the cells of the host.
Class I. Plasmodiophoreae.
A single family. Plasmodiophoraceae (P. 7)

A. Saprophytic.
B. Plasmodium of incompletely fused cells; spores masses without a wall; without zoospores.
Class II. Acrasieae. (P. 8)
B. Plasmodium of completely fused cells; zoospores present.
Class III. Myxomycetae.
C. Spores developed superficially upon erect branching sporophores.
Sub-class I. Ceratiomyxeae.
A single family. Ceratiomyxaceae. (P. 8)
C. Spores in a sporangium with wall.
Sub-class II. Myxogasterae.
D. Spores dark (brown, black, or violet).
E. Sporangium with lime; capillitium present.
Order I. Physarales.
F. Lime in the form of small round granules which may be found in any part of the sporangium.
Family (1) Physaraceae. (P. 8)
F. Lime in the form of crystals which are on the surface of the sporangium.
Family (2) Didymiaceae. (P. 23)
E. Sporangium without lime; capillitium solid.
Order II. Stemonitales.
G. Sporangia distinct, stalked.
Family (3) Stemonitaceae. (P. 26)
G. Sporangia united into an aethalium.
Family (4) Amaurochaetaceae. (P. 32)
D. Spores generally yellowish in color, never black. Lime absent.
H. Capillitium wanting or imperfect. Order III. Liceales
I. Sporangia distinct.
J. Sporangium wall without definite thickenings.
Family (5) Liceaceae (P. 33)
J. Sporangium wall with thickenings in the form of a net or of ribs.
Family (6) Cribrariaceae (P. 34)

I. Sporangia combined into an aethalium.
K. Sporangia well defined, tubular, with lateral walls entire.
Family (7) Tubiferaceae (P. 37)
K. Sporangia poorly defined; walls perforated or frayed into strands which may resemble a capillitium.
Family (8) Reticulariaceae (P. 38)
H. Capillitium present. Order IV. Trichiales
L. Capillitium threads solid, coiled or straight, simple or branched.
Family (9) Margaritaceae (P. 39)
L. Capillitium threads tubular.
M. Capillitium of colorless branching wrinkled tubules. Sporangia combined into an aethalium.
Family (10) Lycogalaceae (P. 40)
M. Capillitium of threads marked by half rings, cogs, or warts.
Family (11) Arcyriaceae (P. 40)
M. Capillitium of threads marked by spiral bands or complete rings.
Family (12) Trichiaceae (P. 44)

CLASS I. **PLASMODIOPHOREAE**

Vegetative stage a plasmodium found in the cell of living plants. Spores are formed by the plasmodium breaking up into a large number of independent cells being massed in the cells either as free spores or united into groups. This class includes but a few species distributed among four genera. Only one species, that causing the club root of cabbage, will be considered here.

PLASMODIOPHORA. Woronin. Club Root.

Parasitic in the parenchymatous cells of the roots of living plants. The plasmodia fill the cells and cause abnormal growths in the parasitized tissue.

P. brassicae Wor. This parasite effects the roots of cabbage, turnips, and other cruciferous plants, causing abnormal growths, often of considerable size and of various shapes. These growths interfere seriously with the normal development of the plant and sometimes whole fields of cabbage are ruined by this disease. When infected roots decay the spores are set free and later germinate, forming zoospores which probably enter new hosts through the root hairs.

Heavy applications of lime have been found to aid in controlling the pest. The best method of control, however, is to grow cabbage on non infested land. If ground becomes infested the parasite may be starved out if no cruciferous plants are allowed to grow on the ground for three or fours years. Especial care should be taken to have the seed bed in which cabbage plants are started free from the parasite.

Common.

CLASS II. ACRASIEAE

Dictyostelium sp. (diagrammatic). Plate X, Figs. 7, 7a, and 7b.

Saprophytic; vegetative stage of incompletely fused cells, amoeboid in character, never ciliated. At maturity these cells collect and form into masses of spores which are not enclosed by a sporangium wall. Each cell may produce a spore when the spore mass will be sessile (Acrasia) or the cells may pile up and the lower central ones form a vesicular stalk upon which the remainder of the cells creep and produce a cylindrical mass of spores (Dictyostelium).

CLASS III. MYXOMYCETAE

Saprophytic; vegetative stage a plasmodium of completely fused cells which at maturity produces numerous spores either free or in sporangia.

SUB-CLASS I. CERATIOMYXEAE

Spores white, stalked, developed superficially upon erect branching sporophores. A single genus including but one quiet variable species.

CERATIOMYXA. Schroeter

Ceratiomyxa fruticulosa (Muell) Macbr. Plate IV, Figs. 6, 6a, and 6b.

Sporophores white, membranous, branching, the surface divided into areolae from the center of each of which a pedicle arises bearing a single white ovoid spore.

C. fruticulosa (Muell.) Macbr. Characters of the genus. A most variable species.

Common everywhere on rotten wood and sticks.

SUB-CLASS II. MYXOGASTERAE

Spores in a sporangium with wall. Capillitium usually present in the sporangia and scattered among the threads of this capillitium are the spores. Lime is present in the members of the first order either as microscopic granules or crystals. Sporangia may be distinct or combined into aethalia.

ORDER I. PHYSARALES

Lime present either as small round granules found in any part of the sporangium or as crystals on the surface of the sporangium.

FAMILY I. PHYSARACEAE

Sporangia distinct, plasmodiocarpous, or combined into an aethalium. Lime present as small round granules found in the sporangium wall or in the capillitium; in Diachaea the lime is found in the stalk and columella only.

KEY TO THE GENERA OF PHYSARACEAE

A. Network of capillitium calcarious thruout. 1. *Badhamia*

A. Network of capillitium consisting of hyaline threads with expansions containing lime granules.

B. Fructification aethaloid. 2. *Fuligo*

B. Fructification of distinct sporangia.

C. Sporangium wall with lime.

D. Sporangia tubular. 4. *Physarella*

D. Sporangia goblet shaped. 5. *Craterium*

D. Sporangia variously shaped. 3. *Physarvm*

C. Sporangium wall without lime.

E. Sporangia forming net like plasmodiocarps. 6. *Cienkowskia*

E. Sporangia distinct, shining. 7. *Leocarpus*

A. Capillitium without lime.

F. Outer sporangium wall with lime. 8. *Diderma*

F. Sporangium wall without lime. Stalk with lime. 9. *Diachaea*

1. **BADHAMIA.** Berkeley

Badhamia rubiginosa (Chev.) Rost. Plate 1, Fig. 1, 1a, and 1b.
Badhamia papaveracea Berk. Plate 1, Fig. 2.
Badhamia panicea Rost. Plate 1, Fig. 3.

Sporangia distinct or united into plasmodiocarps; stalked or sessile; sporangium wall of a single layer with included lime granules; capillitium a course network filled thruout with lime granules, except that in some species the narrower strands may be destitute of lime. Spores clustered into groups of from 6 to 20 or separate.

A. Spores clustered.

B. Spores closely adhering in clusters of from 6 to 10; stalk dark colored. 1. *B. papaveracea*

B. Spores loosely adhering; stalk light colored, often absent.

C. Spores dark brown, in clusters of 8 to 20. 2. *B. capsulifera*

C. Spores bright brown or violet, in clusters of 6 to 10, sometimes separate 3. *B. utricularis*

A. Spores separate.

D. Sporangia yellow. 4. *B. decipens*

D. Sporangia gray.

E. Sporagia always sessile. 5. *B. panicea*

E. Sporangia generally stalked.

F. Sporangia subglobose; stalks black below, white above. 6. *B. affinis*

F. Sporangia discoid; stalk black. 7. *B. orbiculata*

D. Sporangia pink or brown.

G. Sporangia sessile; columella absent. 8. *B. lilacina*

G. Sporangia stalked; columella present. 9. *B. rubiginosa*

1. **B. papaveracea** Berk. and Rav. Sporangia distinct, gregarious, globose, 0.7mm. in diam., gray, stalked; sporangium wall with little lime. Stalk dark brown or black, short. Capillitium a network with large expanded thin nodes. Spores purplish brown, closely adherent into groups

of from 6 to 10, the outer surface of each spore in the cluster being strongly warted, 10 to 13mmm. in diam.

(Miami Valley—Morgan).

2. **B. capsulifera** (Bull.) Berk. Sporangia gregarious, globose, 1 to 1.5mm. in diam., light gray, sessile or sometimes stalked. Sporangium wall translucent, with little lime. Stalk, when present, membranous. Capillitium similar to that of B. papaveracea. Spores dark brown, loosely adhering in groups of 8 to 20, spinulose, 11 to 13mmm. in diam.

(Miami Valley—Morgan).

3. **B. utricularis** (Bull.) Berk. Sporangia clustered, ovoid or globose, 0.5 to 1mm. in diam., cinereous or iridescent violet, sessile or stalked. Stalk, when present, membranous, straw colored, branching, reclining. Spores bright brown, loosely adhering in groups of from 6 to 10, sometimes separate, spinulose, 10 to 12mmm. in diam.

(Miami Valley—Morgan).

4. **B. decipens** Berk. Sporangia distinct, subglobose, 0.3 to 0.7mm. in diam., sessile, sometimes forming plasmodiocarps, yellowish. Sporangium wall rough containing yellow lime granules. Capillitium yellow, containing much lime. Spores violet, separate, spinulose, 10 to 12mmm. in diam.

Cuyahoga Co. (Miami Valley—Morgan).

5. **B. panicea** (Fries) Rost. Sporangia distinct but often closely clustered, hemispherical, 0.5 to 1mm. in diam. cinereous, sessile. Sporangium wall translucent, roughened by lime collected into scale like masses.

Capillitium dense, white, sometimes cohering at the base as a pseudocolumella. Spores violet brown, separate, minutely roughened, 10 to 13mmm. in diam.

Cuyahoga Co. (Miami Valley—Morgan).

6. **B. affinis** Rost. Sporangia distinct, gregarious, subglobose, depressed above, flattened or umbilicate below, small, grayish white, stalked or sessile. Stalk when present furrowed, black below, and white above, or wholly black. Capillitium calcareous thruout, white with large branching nodes. Spores violet brown, minutely roughened, 12 to 15mmm. in diam.

(Miami Valley—Morgan.)

7. **B. orbiculata** Rex. Sporangia scattered, discoidal, 0.7mm. in diam. gray, stalked or sessile, sometimes plasmodiocarpous. Stalk black, furrowed, very short. Capillitium calcareous thruout, white, often more dense at the center of the sporangium. Spores violet brown, minutely roughened, 12 to 15mmm. in diam.

This species is closely related to B. affinis but the sporangia of B. orbiculata are larger and more discoidal in shape. Erie Co., Hamilton Co., (Hamilton Co.—Lloyd Herbarium). (Miami Valley—Morgan). (Lorain Co.—Oberlin College Herbarium).

8. **B. lilacina** Rost. Sporangia clustered, subglobose, about 0.5mm. in diam., smooth, pale or lilac colored, generally sessile. Capillitium a light colored dense network with angular nodes, calcareous thruout. Spores dark purple brown, very rough or reticulated, 10 to 15mmm. in diam.

Summit Co. (Miami Valley–Morgan).

9. **B. rubiginosa** (Chev.) Rost. Sporangia gregarious, obovoid, 0.5 mmm. in diam., reddish or purplish brown, stalked, sporangium wall darker and more persistent below. Stalk erect, smooth, purplish brown, extending into the sporangium to more than half its height as a prominent columella Spores dark purple brown, minutely roughened, 12 to 14mmm. in diam.

Summit Co. (Miami Valley—Morgan), (Licking Co.—Oberlin College Herbarium).

Var. 1—dictyospora Lister. Spores prominently warted or reticulated. Hocking Co.

2. FULIGO. Haller.

Fuligo septica (L.) Gmel. Plate 1, Figs. 4, and 4a.

Sporangia irregular, interwoven, combined into a cushion shaped aethalium. The outer layer of sporangia is without spores and is densely charged with lime forming a cortex. Capillitium of hyaline threads generally branching and forming a network, containing large lime knots.

A. Spores spherical.
  B. Spores nearly smooth, 7 to 10mmm. *1. F. septica*
  B. Spores spinulose, 10 to 12mmm. *2. F. muscorum*
A. Spores ellipsoidal, spinulose. *3. F. cinerea*

1. **F. septica** (L.) Gmelin. Aethalia from one to many centimeters in diameter, 1cm. or more in thickness, yellow, brown, or gray, cortex abundant or sometimes scanty. Capillitium a loose network of hyaline threads with expanded nodes and containing fusiform or branching yellow, sometimes white, lime knots. Spores violet, nearly smooth, 7 to 10mmm. in diam.

Common everywhere on logs and stumps.

2. **F. muscorum** Alb. and Schwein. Aethalia small, 2mm. to 5mm. in diam., yellowish gray, cortex scanty. Capillitium of numerous irregular orange lime knots connected by hyaline threads. Spores violet brown, spinulose, 10 to 11mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

3. **F. cinerea** (Schw.) Morg. Aethalia elongated scattered or gregarious, usually covered with a smooth white cortex. Capillitium of large white lime knots connected by hyaline threads. Spores violet brown, spinulose, ellipsoidal, 14 to 16x11 to 12mmm. in diam.

Erie Co. (Lorain Co.—Oberlin College Herb.), (Ohio—Macbride) (Ohio—Lister).

3. PHYSARUM. Persoon.

Physarum nutans Pers. Plate II, Fig. 2.
Physarum polycephalum Schwein. Plate II, Fig. 5.
Physarum sinuosum (Bull.) Weinn. Plate II, Fig. 4.
Physarum vernum Somm. Plate II, Figs. 3, 3a, and 3b.
Physarum viride (Bull.) Pers. Plate II, Figs. 1 and 1a.

Sporangia distinct or plasmodiocarpous, stalked or sessile. Sporangium wall single or double containing lime granules. Capillitium a network with expanded nodes containing deposits of lime.

A. Sporangia always sessile. (Nos. 12, 14, 15, 19, 22, and 28 are sometimes sessile).
  B. Sporangia white or gray.
    C. Outer sporangia wall very smooth.
      D. Outer wall forming a shell like crust. — 1. *P. testaceum*
      D. Outer wall not shell like. — 2. *P. bitectum*
    C. Outer sporangia wall not very smooth.
      E. Sporangia strongly compressed laterally, sinuous. — 3. *P. sinuosum*
      E. Sporangia not laterally compressed.
        F. Spores 7 to 8mmm. in diam. — 4. *P. cinereum*
        F. Spores 9 to 11mmm. in diam. — 5. *P. vernum*
  B. Sporangia yellow.
    G. Lime knots white. — 6. *P. contextum*
    G. Lime knots yellow.
      H. Spores 10 to 12mmm. in diam. — 7. *P. serpula*
      H. Spores 7 to 9mmm. in diam. — 8. *P. virescens*
  B. Sporangia red or brown
    I. Lime knots white. — 9. *P. atrum*
    I. Lime knots orange or red.
      J. Lime knots angular. — 10. *P. rubiginosum*
      J. Lime knots rounded. — 11. *P. lateritium*

A. Sporangia stalked.
  K. Sporangia white or gray.
    L. Stalk yellow.
      M. Sporangia clustered. — 12. *P. polycephalum*
      M. Sporangia single. — 13. *P. nucleatum*
    L. Stalk white, sometimes dark.
      N. Sporangia ovoid. — 14. *P. didermoides*
      N. Sporangia globose, or subglobose.
        O. Stalk stout.
          P. Sporangia laterally compressed. — 15. *P. compressum*
          P. Sporangia globular. — 16. *P. leucopus*
        O. Stalk slender.
          Q. Capillitium very persistent. — 17. *P. globuliferum*
          Q. Capillitium slightly persistent. — 18. *P. compactum*
      N. Sporangia lenticular. — 19. *P. nutans*
    L. Stalk red.
      X. Columella prominent. — 20. *P. penetrale*
      X. Columella wanting. — 21. *P. pusillum*
  K. Sporangia yellow.

R. Stalk brown.
S. Sporangia globose. 22. *P. maydis*
S. Sporangia depressed globose. 23. *P. auriscalpum*
R. Stalk yellow.
T. Lime knots numerous.
Y. Columella absent. 24. *P. tenerum*
Y. Columella present. 24b. *P. citrinum*
T. Lime knots very small. 25. *P. galbeum*
R. Stalk white or gray.
U. Lime knots large, angular, light colored. 26. *P. melleum*
U. Lime knots small, spindle shaped, yellow. 27. *P. viride*
R. Stalk red. 28. *P. flavicomum*
K. Sporangia red or brown.
V. Lime knots brown. 29. *P. murinum*
V. Lime knots red. 30. *P. pulchripes*
K. Sporangia purple. 31. *P. pulcherrimum*

1. **P. testaceum** Sturgis. Sporangia clustered, subglobose, white, sessile, 0.7mm. in diam. Sporangium wall of two distinct layers, the outer a smooth white shell, separating from the membranous colorless inner layer. Capillitium of numerous angular and branching white lime knots of variable size connected by short hyaline threads. Spores purple, spinulose, darker and rougher on one side, 8 to 10mmm. in diam.

(Ohio—Lister).

2. **P. bitectum** Lister. Sporangia scattered, subglobose, or forming plasmodiocarps, smooth, light colored, sessile, 0. 7mm. in diam. Sporangium wall double, outer wall smooth, deciduous above, recurved and persistent. Capillitium of numerous white lime knots connected by hyaline threads. Spores purple brown, spinulose, darker and rougher on one side, 10 to 12mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

3. **P. sinuosum** (Bull.) Weinm. Sporangia scattered, elongated, much compressed laterally, sinuous, dehiscing along the upper ridge, gray, sometimes yellowish, sessile. Sporangium wall double; outer wall thick, fragile especially above; inner wall delicate, wrinkled, colorless. Capillitium of numerous white lime knots connected by hyaline threads. Spores violet brown, uniformly spinulose, 8 to 10mmm. in diam.

Common.

4. **P. cinereum** (Batsch) Pers. Sporangia gregarious or crowded, subglobose or plasmodiocarpus, cinereous, sessile, 0.4mm. in diam. Sporangium wall single, membranous, containing clusters of white lime granules. Capillitium of numerous white variously shaped lime knots connected by hyaline threads. Spores violet brown, somewhat rough, 7 to 8mmm. in diam.

Common. Occasionaly found on grass in lawns.

5. **P. vernum** Somm. Sporangia subglobose or plasmodiocarpous, 0.5 to 1mm. in diam., gray, sessile. Sporangium wall membranous generally containing much lime. Capillitium as in P. cinereum. Spores purple brown, spinulose, 9 to 12mmm. in diam.

Erie Co.

6. **P. contextum** Pers. Sporangia subglobose or somewhat elongated, 0.5mm. in diam., yellowish, sessile. Sporangia wall double, the outer thick containing much lime, the inner thin. Capillitium of large branching white lime knots connected by short hyaline threads. Spores violet brown, spinulose, 10 to 13mmm. in diam.

Rather common.

7. **P. serpula** Morgan. Sporangia crowded, subglobose or usually forming plasmodiocarps of various shapes as lines, circles, etc., 0.3mm. in diam., pale yellow, sessile. Sporangium wall single containing yellow lime granules. Capillitium of yellow angular lime knots connected by short hyaline threads. Spores purple brown, spinulose, 10 to 12mmm. in diam.

Hocking Co. (Miami Valley—Morgan), (Ohio—Lister).

8. **P. virescens** Ditm. Sporangia, crowded, subglobose, small, 0.3mm. in diam., yellowish, sessile. Sporangium wall membranous, thin containing yellow lime granules. Capillitium of irregular yellow lime knots connected by hyaline threads. Spores violet, minutely roughened, 7 to 9mmm. in diam.

Summit Co. (Miami Valley—Morgan), (Ohio—Macbride).

9. **P. atrum** Schwein. Sporangia clustered or heaped, small, dull violet brown, sessile. Sporangium wall membranous with little lime. Capillitium scanty, of small angular white lime knots connected by short hyaline threads. Spores violet brown, warted, 10 to 12mmm. in diam.

(Miami Valley—Morgan).

10. **P. rubiginosum** Fries. Sporangia gregarious, subglobose, 0.5 to 1mm. in diam., red or brown, sessile. Sporangium wall membranous, containing clusters of red or orange lime granules. Capillitium of large angular red lime knots connected by a dense network of hyaline threads. Spores violet brown, spinulose, 8 to 11mmm. in diam.

Lucas Co., (Miami Valley—Morgan), (Ohio—Macbride).

11. **P. lateritium** (Berk. & Br.) Morg. Sporangia gregarious, subglobose or forming plasmodiocarps, 0.3 to 0.7mm. in diam., red or red brown, sessile. Sporangium wall rugulose, membranous, containing clusters of red or orange lime granules. Capillitium of rounded orange lime knots connected by delicate hyaline or yellowish threads. Spores violet brown, minutely roughened, 7 to 9mmm. in diam.

Not rare in Ohio.

12. **P. polycephalum** Schwein. Sporangia confluent in clusters of from five to many, gray or yellowish, stalked, the stalks of the cluster combined; the entire cluster often having the appearance of a mass of rope upon a post. Sporangium wall membranous with scattered clusters of lime granules. Capillitium of yellow lime knots connected by a network of threads. Spores violet brown, minutely roughened, 9 to 10mmm. in diam.

Common on logs, sticks, leaves, etc.

13. **P. nucleatum** Rex. Sporangia gregarious, globose, 0.5mm. in diam., white, stalked. Sporangium wall membranous containing clusters of white lime granules. Stalk 1mm. long, yellow, rugose. Columella none. Capillitium of small white lime knots connected by a network of colorless threads, having usually a white ball of lime at the center. Spores violet brown, minutely spinulose, 6 to 7mmm. in diam.

Summit Co., Jefferson Co., (Licking Co.—Oberlin College Herb.)

14. **P. didermoides** (Acharius) Rost. Sporangia crowded, ovoid, about 0.5mm. in diam., white, stalked or sessile. Outer sporangium wall densely charged with white lime granules, early deciduous, leaving the sporangia dark gray in color. Stalk white, membranous, variable in size, often flattened. Hypothallus white. Capillitium of numerous rounded white lime knots connected by short hyaline threads. Spores dark violet, spinulose, 10 to 13mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride), (Ohio—Lister.)

15. **P. compressum** Alb. & Schw. Sporangia gregarious, subglobose, or reniform, compressed, splitting along the ridge, white or gray, stalked or sessile, roughened. Sporangium wall membranous containing dense clusters of white lime granules. Stalks stout, furrowed. Columella absent. Capillitium of numerous white lime knots connected by hyaline threads. Spores dark brown, spinulose, 9 to 14mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

16. **P. leucopus** Link. Sporangia gregarious, globose, 0.5mm. in diam., white, stalked. Sporangium wall membranous, containing white lime granules. Stalk white, stout, larger at base, short, brittle. Columella absent. Capillitium of large irregular white lime knots connected by hyaline threads. Spores violet brown, spinulose, 8 to 10mmm. in diam.

Not rare in Ohio.

17. **P. globuliferum** (Bull.) Pers. Sporangia gregarious, globose, 0.5mm. in diam., white, stalked, erect. Sporangium wall membranous containing lime granules. Stalk white, sometimes dark below, about 1mm. long. Columella present, conical. Capillitium of white rounded lime knots connected by a network of hyaline threads, persistent and retaining the form of the sporangia after spore disperal. Spores violet brown, minutely roughened, 6 to 8mmm. in diam.

Common.

18. **P. compactum** (Wing.) Lister. Sporangia gregarious, globose, 0.5mm. in diam., gray or bronze, iridescent spotted with white, stalked, erect, or nodding. Sporangium wall membranous containing rounded clusters of lime granules, splitting at maturity in a floriform manner into a number of segments. Stalk slender, furrowed, light colored, darker below. Capillitium slightly persistent consisting of a few small white lime knots connected by delicate colorless branching threads, and having a dense globular cluster of lime knots at the center. Columella absent. Spores violet brown, minutely roughened, 7 to 8mmm. in diam.

Not rare in Ohio.

19. **P. nutans** Pers. Sporangia gregarious, flattened or lenticular, 0.5 to 0.6mm. in diam., gray, stalked, generally nodding. Sporangium wall membranous containing clusters of white lime granules. Stalk subulate, variable in height and color, usually some shade of gray. Capillitium of of few small white lime knots connected by a mass of colorless threads which branch at an angle. Spores dark brown, smooth, 8 to 9mmm. in diam.

Common everywhere in Ohio on sticks and logs.

20. **P. penetrale** Rex. Sporangia scattered, ellipsoid or globose, small, gray or yellowish, stalked, erect or nodding. Sporangium wall smooth, membranous, containing clusters of pale yellow or gray lime granules, splitting at maturity into from one to four segments. Stalk variable in length, slender, subulate, smooth, solid, translucent, dull red or golden red, extending into the sporangium as a columella to some four-fifths of its height. Capillitium of small yellow rounded lime knots scattered in a dense network of hyaline threads. Spores violet brown, minutely roughened 5 to 7mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

21. **P. pusillum** (B. & C.) Lister. Sporangia scattered, subglobose, 0.4 to 0.6mm. in diam., white with reddish base, rugose, stalked, erect or somewhat inclined. Sporangium wall membranous, with dense clusters of included white lime granules. Stalk reddish, furrowed. Columella absent. Capillitium of white lime knots, of variable size connected by a network of colorless threads. Spores pale brownish-violet, almost smooth, 8 to 11mmm. in diam.

(Miami Valley—Morgan), (Cuyahoga Co.—Lloyd Herb).

22. **P. maydis** (Morgan) Torrend. Sporangia gregarious, globose or obovoid, 0.4 to 0.6mm. in diam., yellow, stalked. Sporangium wall scaly, yellow above, red below, containing yellow lime granules. Stalk red brown, translucent, variable in size and length. Columella absent. Capillitium of numerous branching yellow lime knots connected by a

network of hyaline threads expanded at the axils. Spores pale violet, minutely roughened, 9 to 10mmm. in diam.

On corn stalks. (Miami Valley—Morgan).

23. **P. auriscalpum** Cooke Sporangia gregarious, depressed globose, 0.4 to 0.8mm. in diam., yellow or rufous, usually with short stalks. Sporangium wall membranous, containing yellow lime granules. Stalks short, dark brown, translucent. Columella absent. Capillitium of large branching yellow lime knots connected by delicate hyaline threads. Spores violet brown, minutely spinulose, 9 to 10mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

24. **P. tenerum** Rex. Sporangia gregarious, globose, small, 0.4mm. in diam., yellowish, stalked. Sporangia wall membranous containing rounded clusters of lime granules. Stalk long, yellow, darker below. Columella absent. Capillitium of numerous rounded yellow lime knots connected by a dense network of hyaline threads. Spores violet brown, minutely roughened, 7 to 9mmm. in diam.

Not rare in Ohio.

24b. **P. citrimun** Schum. Sporangia gregarious, globose, yellow, stalked, 0.4 to 0.7mm. in diam. Stalk stout, furrowed, golden yellow, opaque. Columella conical or obtuse, short. Capillitium of numerous rounded yellow lime knots connected by a network of rigid hyaline threads persistent after spore dispersal. Spores violet brown, nearly smooth 7 to 9mmm. in diam.

(Ohio—Macbride), (Miami valley—Morgan), (Lorain Co.—Oberlin College Herb.).

25. **P. galbeum** Wing. Sporangia scattered, globose, 0.4 to 0.5mm. in diam., yellow, smooth, stalked, erect or nodding. Sporangia wall membranous, containing dense clusters of yellow lime granules. Stalk subulate, longer than the diameter of the sporangium, yellow, sometimes darker below. Capillitium a dense network of light colored threads with scanty lime knots which when present are found in the axils of the network. Spores pale violet, almost smooth, 7 to 9mmm. in diam.

Cuyahoga County.

26. **P. melleum** (Berk. & Br.) Mass. Sporangia scattered, globose, 0.5mm. in diam., yellow, stalked, erect. Sporangium wall membranous containing small yellow lime granules. Stalk white or light colored, stout, furrowed. Columella short, white, conical. Capillitium of large angular white or light colored lime knots connected by a network of delicate hyaline threads. Spores violet brown, nearly smooth, 7 to 9mmm. in diam.

Common.

27. **P. viride** (Bull.) Pers. Sporangia gregarious, lenticular, 0.3 to 0.5mm. in diam., yellow, stalked, nodding. Sporangium wall membranous

containing clusters of yellow lime granules, dehiscing in fragments. Stalk slender, furrowed, gray, sometimes darker below. Columella absent. Capillitium of small spindle shaped yellow lime knots connected by a network of hyaline threads which branch at an acute angle. Spores violet brown, smooth, 7 to 9mmm. in diam.

Common.

Var.—*incanum* Lister. Sporangia gray. Lime knots pale yellow. Erie Co.

28. **P. flavicomum** Berk. Sporangia gregarious, subglobose, 0.4 to 0.5mm. in diam., yellow stalked, nodding. Sporangium wall thin, membranous. Stalk slender, subulate, fluted, red. Capillitium of small yellow angular lime knots in a dense persistent network of hyaline threads. Spores violet brown, minutely roughened, 7 to 9mmm. in diam.

(Miami Valley—Morgan), (Hamilton Co.—Lloyd Herbarium).

29. **P. murinum** Lister. Sporangia gregarious, globose, 0.5mm. in diam., pale brown, rugulose, stalked or sessile, sometimes forming plasmodiocarps. Sporangium wall membranous containing clusters of brown lime granules. Stalk slender, erect, brown, furrowed, containing lime. Columella short, conical. Capillitium of brown lime knots connected by a network of hyaline threads. Spores violet brown, nearly smooth, 8 to 9mmm. in diam.

Not rare.

30. **P. pulchripes** Peck. Sporangia gregarious, globose, about 0.5mm. in diam., red or brown, stalked. Sporangium wall membranous containing lime granules. Stalk red, often darker below, slender, tapering, brittle. Columella short, conical. Capillitium of rounded reddish lime knots connected by a dense persistent network of hyaline threads. Spores violet brown, nearly smooth, 7 to 8mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

31. **P. pulcherrimum** Berk. & Rav. Sporangia gregarious, globose, about 0.5mm. in diam., purple or wine red, stalked, erect. Sporangium wall membranous containing clusters of large purple lime granules. Stalk purple, 1mm. long, brittle. Columella small or absent. Capillitium of numerous small rounded purple lime knots connected by a dense network of delicate light purple threads. Spores pale red, nearly smooth, 7 to 8mmm. in diam.

Not rare.

4. **PHYSARELLA** Peck.

Physarella oblonga (B. & C.) Morgan. Plate 1, Fig. 5, 5a, and 5b.

Sporangium pervious to the base, the interior walls forming a persistent spurious columella; capillitium composed of filaments with here and there minute knot-like thickenings, straight tubes containing lime granules

extending from the exterior to the interior walls of the sporangium, persistently attached to the former.

1. **P. oblonga** (B. & C.) Morgan. Sporangia gregarious, the shape of an empty cup, the upper part of the sporangium being depressed so that a deep hollow is produced and which is continuous with the hollow of the stalk, 0.6mm. in diam., by 0.8mm. in length, greenish yellow, stalked, nodding. Sporangium wall membranous containing dense deposits of yellow lime granules, dehiscing from the apex into a few stellate reflexed lobes, leaving the depressed portion of the wall remaining as a long hollow columella. Stalk cylindrical, inclined, furrowed, red brown. Capillitium of a few spindle shaped yellow lime knots, connected by branching pale yellow threads, which extend from the columella outward to the wall. Spores violet brown, smooth, 6 to 8mmm. in diam.

Common.

5. CRATERIUM Trentepohl.

Craterium aureum (Schum.) Rost. Plate 1, Fig. 8, 8a, and 8b.
Craterium leucocephalum (Pers.) Ditm. Plate 1, Fig. 7 and 7a.
Craterium minutum (Leers) Fr. Plate 1, Fig. 6.

Sporangia stalked, cup shaped, covered with a distinct lid, or globular and without a distinct lid. The upper part of sporangium wall charged with lime, the lower part cartilaginous and persistent as a well defined goblet shaped cup. Capillitium consisting of large lime knots connected by hyaline threads, the central lime knots forming more or less of a pseudo-columella.

A. Sporangium wall glossy, opening by a distinct lid.
  B. Lime knots large, light colored. 1. *C. minutum*
  B. Lime knots numerous, brown. 2. *C. concinnum*

A. Sporangium wall mealy, lid less distinct or wanting.
  C. Sporangia white above, brown below, lid evident.
    D. Sporangia ovoid. 3. *C. leucocephalum*
    D. Sporangia cylindrical. 4. *C. minimum*
  C. Sporangia yellow, lid not evident. 5. *C. aureum*

1. **C. minutum** (Leers) Fries. Sporangia gregarious, goblet shaped, 0.4 to 0.5mm. in diam., smooth, grayish brown, stalked, lid convex, sometimes flat or depressed. Sporangium wall double. Stalk brown, cylindrical, furrowed. Capillitium of large white lime knots connected by slender threads. Spores violet brown, minutely warted, 8 to 9mmm. in diam.

Hocking Co., Summit Co.

2. **C. concinnum** Rex. Sporangia scattered, broadly funnel shaped, very small, smooth, brown or pinkish, stalked. Lid distinct, convex, light colored. Sporangium wall single, cartilaginous. Stalk brown, furrowed, short. Columella absent. Capillitium of numerous angular brown lime

knots connected by short hyaline threads. Spores pale brown, minutely warted, 8 to 10mmm. in diam.

(Miama Valley—Morgan).

3. **C. leucocephalum** (Pers.) Ditm. Sporangia gregarious, ovate, 0.5 to 0.6mm. in diam., white above, red brown below, stalked. Lid indistinct, convex, white. Sporangium wall thin, double, mealy from deposits of lime. Stalk cylindrical, furrowed, brown. Capillitium of large white or yellowish branching hyaline threads. Spores violet brown, minutely spinulose, 8 to 9mmm. in diam.

Common.

4. **C. minimun** Berk. and Curt. Sporangia gregarious, cylindrical, small, nearly white, with a brown base. Lid indistinct, convex. Sporangium wall thin, double, mealy from deposits of lime. Stalk short, cylindrical, furrowed, brown. Capillitium of large white lime knots connected by hyaline threads. Spores violet brown, minutely spinulose 8 to 9mmm. in diam.

Common.

5. **C. aureum** (Schum.) Rost. Sporangia gregarious, globose or obovoid, 0.4 to 0.6mm. in diam., yellow, without a definite lid. Sporangium wall thin, single, the upper part breaking up irregularly at maturity leaving the lower part as a cup. Stalk cylindrical, stout, furrowed, orange or yellow. Capillitium of yellow irregular lime knots connected by a network of hyaline threads. Spores violet brown, minutely spinulose, 8 to 9mmm. in diam.

This species is closely related to certain species of the genus Physarum and could with equal propriety be placed in that genus.

Common.

6. CIENKOWSKIA Rost.

Cienkowskia reticulata (A. & S.) Rost. Plate III, Fig. 1, 1a, and 1b.

Sporangia forming branching net like plasmodiocarps. Sporangium wall without lime. Capillitium of plates of lime attached to the inner sporangium wall and connected by a rigid network of threads which have many free curved sharp pointed branchlets.

1. **C. reticulata** (A. & S.) Rost. Sporangia sessile forming an elongated net like plasmodiocarp, 0.5mm. in diam., orange yellow, blotched with crimson, transversely ridged. Sporangium wall double. Columella absent. Capillitium consisting of an elastic network of flexuose rigid yellow threads with numerous free, pointed, curved, branchlets, and of lime in the form of flat perforated pale yellow plates disposed transversely to the axis of the sporangium and connected by broad or narrow attachments to the sporangium wall, occasionally with irregular lime knots intermixed. Spores violet brown, minutely spinulose, 9 to 11mmm. in diam.

(Miami Valley—Morgan).

7. LEOCARPUS Link.

Leocarpus fragilis (Dickson) Rost. Plate III, Fig. 2, 2a, and 2b.

Sporangia sessile or stalked. Sporangium wall without lime, double, the outer firm, smooth, and shining. Capillitium a rigid network of hyaline threads connecting large irregular branching lime knots.

1. **L. fragilis** (Dickson) Rost. Sporangia gregarious, obovoid, yellowish brown, polished, stalked or sessile. Sporangium wall double. Columella absent. Stalk short, weak, yellowish, membranous. Capillitium of large branching brown lime knots connected by a network of rigid hyaline threads. Spores dark brown, spinulose, 11 to 14mmm. in diam.

Rather common on leaves, twigs, old grape vines etc.

8. DIDERMA Persoon.

Diderma effusum (Schwein.) Morg. Plate III, Fig. 4.
Diderma globosum Pers. Plate III, Fig. 5 and 5a.
Diderma floriforme (Bull.) Pers. Plate III, Fig. 6.
Diderma testaceum (Schrad.) Pers. Plate III, Fig. 3.

Sporangia stalked or sessile, sometimes plasmodiocarpous. Sporangium wall double, the outer wall crustaceous, either calcareous or cartilaginous. Lime in the form of globular non crystaline granules. Capillitium of delicate threads, without lime.

A. Outer sporangium wall calcareous.
  B. Sporangia plasmodiocarpous. — 1. *D. effusum*
  B. Sporangia distinct.
    C. Sporangia white.
      D. Sporangia sessile.
        E. Outer wall very fragile; not wholly separate from inner wall. — 2. *D. spumarioides*
        E. Outer wall firm, egg shell like, wholly separate from the inner wall. — 3. *D. globosum*
      D. Sporangia stalked. — 4. *D. hemisphericum*
    C. Sporangia pale pink, bleaching with age. — 5. *D. testaceum*
A. Outer sporangium wall cartilaginous.
  F. Spores with scattered warts. — 6. *D. floriforme*
  F. Spores minutely roughened. — 7. *D. radiatum*

1. **D. effusum** (Schwein.) Morgan. Sporangia gregarious, much depressed, circular or usually forming net like and effused flat plasmodiocarps. Sporangium wall double, the outer a delicate white crust of lime granules separated from the membranous colorless inner wall. Columella depressed, flesh colored. Capillitium of delicate anastomosing threads. Spores violet brown, nearly smooth, 6 to 8.mmm. in diam.

Common.

2. **D. spumarioides** Fries. Sporangia crowded, globose, about 0.5 to 0.8mm. in diam., white, sessile. Sporangium wall double, the outer thick but very fragile, adhering slightly to the membranous inner wall. Colum-

ella convex, white or light brown. Capillitium of delicate purple, branching threads. Spores violet brown, spinulose, 8 to 11mmm. in diam.

Common.

3. **D. globosum** Pers. Sporangia crowded, globose, 0.5 to 0.8mm. in diam., smooth, white, sessile. Sporangium wall double, the outer forming a hard egg shell like crust, widely separated from the membranous inner wall. Columella hemispherical, white or somewhat colored. Capillitium of delicate purplish branching threads. Spores dark brown, spinulose, 10 to 14mmm. in diam.

Common.

4. **D. hemisphericum** (Bull.) Hornem. Sporangia scattered, disc-shaped, 1 to 1.2mm. in diam., stalked, white. Sporangium wall double, the outer fragile, the inner membranous and more persistent. Stalk about 1mm. long, brownish, wrinkled. Columella indistinct. Capillitium of slender branching threads, usually colorless. Spores violet brown, nearly smooth, 7 to 9mmm. in diam.

Erie Co. Hocking Co.

5. **D. testaceum** (Schrad.) Pers. Sporangia gregarious, or crowded, subglobose, depressed, 0.8mm. in diam., pale pink, bleaching with age. Sporangium wall double, the outer shell like, brittle, smooth, separate from the gray membranous inner wall. Columella large, convex, pink or brown. Capillitium of delicate purplish branching threads. Spores violet brown, nearly smooth, 7 to 8mmm. in diam.

Common.

6. **D. floriforme** (Bull.) Pers. Sporangia crowded, globose, smooth, 0.8mm. in diam., stalked, white or brown. Sporangium wall double, the outer cartilaginous and splitting at maturity into several revolute petal like lobes. Stalk cylindrical, furrowed, brown. Columella prominent, ovoid. Capillitium of dark brown, slender, sparingly branched threads. Spores reddish brown, marked by scattered warts, 9 to 11mmm. in diam.

Not rare in Ohio.

7. **D. radiatum** (L.) Lister. Sporangia scattered, depressed globose, flattened below, about 1mm. in diam., smooth, or slighty wrinkled, gray or brown, stalked or sessile. Sporangium wall double, the outer wall dehiscing in an irregular manner or in revolute lobes. Stalk short, stout, gray or usually brown. Columella large, subglobose, Capillitium abundant, of dark, brown, rigid, sparingly branched threads, spores dark violet brown, minutely roughened, 8 to 11mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

9. **DIACHAEA** Fries.

Diachaea leucopoda (Bull.) Rost. Plate III, Fig. 7.

Sporangia distinct, stalked. Sporangium wall destitute of lime iridescent. Stalk and columella containing lime granules. Capillitium a network of delicate threads without lime, connecting the columella and sporangium wall.

A. Sporangia globos. 1. *D. splendens*
A. Sporangia cylindrical. 2. *D. leucopoda*

1. **D. splendens** Peck. Sporangia gregarious, globose, metallic blue, stalked. Sporangium wall membranous, hyaline. Stalk white, stout, brittle, furrowed, tapering upward from a prominent hypothallus. Columella cylindrical, white. Capillitium of slender anastomosing threads connecting the columella with the sporangium wall. Spores dark violet, coursely warted, 7 to 9mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

2. **D. leucopoda** (Bull.) Rost. Sporangia gregarious, cylindrical, some times globose, 0.7mm. high, iridescent purple, stalked. Spores dull violet, minutely roughened, 7 to 9mmm. in diam. Closely resembling D. splendens except in color, shape of sporangia, and markings of spores.

Common.

FAMILY 2. **DIDYMIACEAE**

Sporangia distinct, except in Mucilago where they are combined into an aethalium. Lime present in the form of crystals or crystaline discs which are on the surface of the sporangium. Capillitium without lime knots.

KEY TO THE GENERA OF DIDYMIACEAE.

A. Lime in the form of crystaline discs.....1. *Lepidoderma*
A. Lime in the form of stellate crystals.
B. Sporangia confluent.....2. *Mucilago*
B. Sporangia distinct.....3. *Didymium*

1. **LEPIDODERMA** De Bary.

Lepidoderma tigrinum (Schrad.) Rost. Plate IV, Fig. 5.

Sporangia distinct, stalked or sessile, sometimes forming plasmodiocarps. Sporangium wall with crystaline discs or scales of lime on the outer surface. Capillitium of branching threads without lime.

1. **L. tigrinum** (Schrad.) Rost. Sporangia scattered, subglobose, depressed, umbilicate beneath, 1mm. in diam., gray, glossy, beset with angular crystaline discs of lime. Sporangium wall yellowish, cartilaginous. Stalk stout, cylindrical, furrowed, brown. Columella hemispherical, orange, containing lime. Capillitium of abundant sparingly branched, purple threads. Spores purplish, minutely roughened, 10 to 13mmm. in diam.

(Miami Valley—Morgan). (Hamilton Co.—Lloyd Herbarium).

2. **MUCILAGO** Adanson.

Mucilago spongiosa (Leysser) Morg. Plate IV, Fig. 4, 4a, 4b, and 4c.

Sporangia combined into an aethalium which is covered by a fragile deciduous white crust of lime crystals. Sporangium wall frosted with crystals of lime. Capillitium of sparingly branched threads without lime.

1. **M. spongiosa** (Leysser) Morg. Aethalium variable in shape and size; not more than 1cm. thick, formed of elongated confluent gray sporangia, the whole covered with a deciduous crust of crystals of lime. Sporangium wall membranous, frosted with lime crystals. Columella hollow, compressed, sometimes absent. Capillitium a branching network of stout purplish threads, with colorless ends which are attached to the sporangium wall or columella. Spores purple,very rough, 10 to 13mmm. in diam.

Common.

3. **DIDYMIUM** Schrader.

Didymium clavus (A. & S.) Rost. Plate IV, Fig. 2.
Didymium melanospermum (Pers.) Macbride. Plate IV, Fig. 3.
Didymium squamulosum (A. & S.) Fr. Plate IV, Fig. 1, 1a, 1b, and 1c.

Sporangia stalked or sessile, sometimes forming plasmodiocarps. Sporangium wall covered with lime in the form of crystals which may be scattered loosely over the surface or combined into a brittle crust. Capillitium of sparingly branched threads without lime knots.

A. Crystals of lime forming a brittle crust around sporangia,
  B. Crust smooth.
    C. Crust thin, dense, diderma like ..... 1. *D. difforme*
    B. Crust thick but fragile ..... 2. *D. crustaceum*
  B. Crust wrinkled ..... 3. *D. squamulosum*
A. Crystals of lime loosely scattered on sporangium wall.
    D. Sporangia disc-shaped ..... 4. *D. lavus*
  D. Sporangia subglobose or plasmodiocarpous.
    E. Sporangia stalked.
      F. Stalk brown or black.
        G. Stalk dark brown, granular.
          H. Sporangia 0.7mm. in diam. 5. *D. melanospermum*
          H. Sporangia 0.5mm. in diam. 6. *D. minus*
        G. Stalk light brown, not granular, columella dark. 7. *D. nigripes*
      F. Stalk orange, columella white. 8. *D. xanthopus*
      F. Stalk white. Forms of. 3. *D. squamulosum*
    E. Sporangia forming plasmodiocarps.
      I. Dehiscence of sporangia circumcissile. 9. *D. anellus*
      I. Dehiscence of sporangia irregular. 3. *D. squamulosum*

1. **D. difforme** (Pers.) Duby. Sporangia distinct, scattered or forming short plasmodiocarps, smooth, white sessile. Sporangium wall double, the outer of small crystals of lime forming a thin dense egg shell like

crust, separating from the membranous inner layer. Columella absent. Capillitium of a few slender branching threads. Spores dark brown, nearly smooth, 11 to 14mmm. in diam.

Erie Co. (Miami Valley—Morgan).

2. **D. crustaceum** Fries. Sporangia aggregated or scattered, globose, smooth, white, stalked or sessile, covered by a thick brittle and fragile crust of loosely compacted crystals. Sporangium wall membranous, colorless, frosted with large stellate crystals of lime. Columella small or obsolete. Capillitium of pale branching threads. Spores purple, strongly spinulose, 10 to 13mmm. in diam.

Erie Co.

3. **D. squamulosum** (A. & S.) Fr. Sporangia gregarious, subglobose, umbilicate below, 0.5 to 1mm. in diam., white, stalked, sessile, or plasmodiocarpous, often covered with a wrinkled deciduous crust of lime crystals. Stalk, when present, white, furrowed, rough. Columella hemispherical, white or yellowish. Capillitium variable, sometimes with calyciform thickenings on the threads. Spores violet brown, roughened, 8 to 10mmm. in diam.

Common.

A most variable species, of which Professor Macbride in "North American Slime-Molds" has the following to say: "This, one of the most beautiful species in the whole series, is remarkable for the variations which it presents in the fruiting phase. These range all the way from the simplest and plainest kind of a plasmodiocarp with only the most delicate frosting of calcareous crystals up through more or less confluent sessile sporangia to well-defined elegantly stipitate, globose fruits, where the lime is sometimes so abundant as to form deciduous flaky scales. The hypothallus, sometimes entirely wanting, is sometimes well developed, even continuous, venulose, from stipe to stipe. The capillitium varies much in abundance as in color; when scanty it is colorless and in every way more delicate, when abundant, darker in color and sometimes with stronger thickenings."

Common.

4. **D. clavus** (A. & S.) Rost. Sporangia scattered, disc-shaped, 0.7 to 1mm. in diam., gray, stalked. Sporangium wall membranous, brown, frosted with clusters of stellate crystals of lime above, naked below. Stalk cylindrical, dark, furrowed. Columella absent. Capillitium abundant of sparingly branched delicate threads. Spores violet, nearly smooth, 6 to 8mmm. in diam.

Rather common.

5. **D. melanospermum** (Pers.) Macbride. Sporangia gregarious, subglobose, umbilicate below, 0.7 to 1mm. in diam., white or gray, stalked or sessile. Sporangium wall firm, brown, frosted with stellate crystals of

lime. Stalk short, stout, striated, dark brown, opaque, granular, arising from a broad base. Columella large, hemispherical, rough above, dark brown. Capillitium of sparingly branched, course, usually dark threads. Spores purplish, roughened, 9 to 12mmm. in diam.

Rather common.

6. **D. minus** Lister. Sporangia gregarious, subglobose, depressed, umbilicate below, 0.5mm. in diam., white or gray, stalked. Stalk slender, granular black. Columella hemispherical, rough. Capillitium of sparingly branched delicate threads. Spores purplish, minutely roughened, 7 to 9mmm. in diam.

Rather common.

7. **D. nigripes** (Link) Fries. Sporangia gregarious, subglobose, umbilicate below, 0.6mm. in diam., white, stalked, erect. Sporangium wall brown, frosted with irregular crystals of lime. Stalk slender, furrowed, translucent, dark in color. Columella subglobose, dark brown. Capillitium of delicate sparingly branched purplish or colorless threads. Spores violet, minutely roughened, 8 to 11mmm. in diam.

Common.

8. **D. xanthopus** (Ditmar) Fries. Sporangia gregarious, subglobose, umbilicate below, white, stalked. Stalk slender, erect, orange yellow. Columella subglobose, white. Capillitium and spores similar to those of D. nigripes.

Erie Co. (Miami Valley—Morgan).

9. **D. anellus** Morgan. Sporangia circular or plasmodiocarpous depressed, 0.3 to 0.5mm. in diam., gray or brown, sessile. Sporangium wall membranous, sparingly frosted with minute crystals of lime and dehiscing in a circumcissile manner. Columella absent. Capillitium of slender violet brown threads, simple or sparingly branched. Spores purplish, minutely spinulose, 7 to 9mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride), (Ohio—Lister).

ORDER 2. STEMONITALES

Sporangia distinct or combined into an aethalium. Lime not present. Capillitium of solid threads, which with the spores is dark in color, occasionally light brown or colorless.

FAMILY 3. STEMONTACEAE

Sporangia distinct, stalked. Stalk extending into the sporangium as a columella, from which the branching threads of the capillitium take their origin. Sporangium covered by a delicate wall which is often evanescent.

KEY TO THE GENERA OF STEMONITACEAE.

A. Capillitium springing from all parts of the columella.
  B. Capillitium branches united into a surface net. 1. *Stemonitis*
  B. Capillitium branches with free tips. 2. *Comatrichia*

A. Capillitium springing from the apex of the columella.
  C. Columella reaching the apex of the sporangium. 3. *Enerthenema*
  C. Columella penetrating to near the center of the sporangium. 4. *Lamproderma*
  C. Columella very short, making the capillitium appear to spring from the base of the sporangium. 5. *Clastoderma*

1. **STEMIONTIS** Gleditsch.

Stemonitis splendens Rost. Plate V, Fig. 1 and 1a.

Sporangia distinct, densely clustered, cylindrical, stalked. Columella prominent, usually extending to near the apex of the sporangium. The capillitium arises from the entire length of the columella as branched threads which unite at the surface of the sporangium to form a net supporting the delicate and evanescent sporangium wall.

A. Spores gray or violet.
  B. Spores reticulated. 1. *S. fusca*
  B. Spores nearly smooth.
    C. Meshes of surface net large, 20 to 100mmm. in diam. 2. *S. splendens*
    C. Meshes of surface net 10 to 20mmm. in diam.
      D. Sporangia in large clusters. 3. *S. herbatica*
      D. Sporangia in small scattered groups. 4. *S. pallida*

A. Spores ferruginous.
  E. Sporangia 8 to 20mm. high. 5. *S. ferruginea*
  E. Sporangia 3 to 6mm. high. 6. *S. smithii*

1. **S. fusca** Roth. Sporangia closely clustered, cylindrical, obtuse, dark purple, stalked. Stalk black, shining, arising from a prominent brown hypothallus. Capillitium arising from the columella as numerous dark brown branches and forming a delicate superficial net with meshes from 6 to 16mmm. wide. Spores gray or violet, reticulated, 8 to 10mmm. in diam.

Common everywhere on rotten logs.

2. **S. splendens** Rost. Sporangia closely clustered, cylindrical, obtuse, dark purple, 8 to 20mm. high, stalked. Stalk black, shining, arising from a prominent silvery or purplish hypothallus. Capillitium purple brown, arising as a few prominent threads from the rigid columella and branching to form a surface net of large rounded meshes from 20 to 70mmm. in diam.

Spores violet brown, nearly smooth, 7 to 9mmm. in diam.

Common everywhere on rotten logs.

Var. 1.—*webberi* (Rex) Lister. Meshes of net very large, 80 to 100mmm. wide. Sporangia stiff, erect.

Not rare.

Var. 2.—*flaccida* (Morgan) Lister. Sporangia weak, adhering to each other. Capillitium lax, scarcely forming a surface net.

Not rare.

3. **S. herbatica** Peck. Sporangia in large dense clusters, cylindrical, 6 to 9mm. high, stalked. Stalk short, arising from a membranous hypothallus. Capillitium of dark brown threads forming a surface net with rounded meshes 10 to 20mmm. in diam. Spores gray, minutely roughened, 6 to 8mmm. in diam.

Erie Co. Summit Co.

4. **S. pallida** Wingate. Sporangia scattered or in small groups, cylindrical, obtuse, short, 5 to 6mm. high, dark brown, stalked. Stalk short. Capillitium of dark brown threads forming a surface net with irregular meshes. Spores gray, minutely roughened, 6 to 8mmm. in diam.

Not rare.

5. **S. ferruginea** Ehrenb. Sporangia in dense clusters, cylindrical, 8 to 20mm. high, light brown, stalked. Stalk black, one-third of total height, arising from a well developed hypothallus. Columella not reaching the apex of the sporangium. Capillitium of brown branching threads which unite to form a delicate surface net with rounded meshes 5 to 10mmm. in diam. Spores pale ferruginous 4 to 6mmm. in diam.

Occasional.

6. **S smithii** Macbr. This species differs from S. ferruginea of which Lister considers it a variety, in its smaller size, 3 to 6mm. high, and in the more delicate threads of the surface net.

Occasional.

2. COMATICHIA Preuss.

Comatrichia irregularis Rex. Plate V, Fig. 2 and 2b.

Sporangia cylindrical or globose, stalked, scattered, sometimes clustered. Sporangium wall evanescent. Stalk black, solid, extending into the sporangium to beyond the middle as a columella. The columella sends out branches from its entire length, which form a branching and anastomosing capillitium. No surface net is formed, the ends of the branches being free.

A. Sporangia long, drooping, clustered. — 1. *C. longa*

A. Sporangia shorter, erect, generally scattered.

B. Sporangia dark.

C. Spores smooth.

D. Capillitium dense. — 2. *C. nigra*

D. Capillitium lax. — 3. *C. laxa*

C. Spores spinulose. — 4. *C. irregularis*

B. Sporangia reddish brown.

E. Sporangia very small, ovoid. Cylindrical in var. gracilis. — 5. *C. pulchella*

E. Sporangia larger, cylindrical. — 6. *C. typhoides*

1. **C. longa** Peck. Sporangia clustered, cylindrical, drooping, 2 to 5cm. long, black, stalked. Stalk slender, 1 to 3mm. long, black, arising from a well developed black hypothallus. Columella slender, weak. Capillitium a lax network of dark brown threads which end in rigid free tips. Spores dark brown, spinulose, 8 to 9mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride), (Lorain Co.—Oberlin College Herbarium).

2. **C. nigra** (Pers.) Schroeter. Sporangia scattered, globose or cylindrical, 1 to 6mm. high, purplish brown, stalked. Stalk long, slender, black, shining. Hypothallus indistinct. Columella extending to more than half the height of the sporangium. Capillitium a dense tangle of branching and anastomosing slender brown threads. Spores violet brown, nearly smooth, 7 to 10mmm. in diam.

Occasional.

Var. 1.—*aequalis* Sturgis. Sporangia gregarious, cylindrical, slender, usually inclined.

(Miami Valley—Morgan), Ohio—Macbride).

3. **C. laxa** Rost. Sporangia scattered or gregarious, subglobose, or short cylindrical, obtuse, 1.5 to 3.5mm. high, stalked. Stalk short, stout, black, shining. Columella rigid, reaching nearly to the apex of the sporangium. Capillitium lax, of slender threads, somewhat branching and anastomosing. Spores violet brown, nearly smooth, 7 to 10mmm. in diam.

Erie Co. Cuyahoga Co. Hocking Co.

4. **C. irregularis** Rex. Sporangia gregarious, cylindrical, 2 to 5mm. high, dark brown, stalked. Stalk black, slender. Columella slender, reaching nearly to the apex of the sporangium. Capillitium a network of arcuate brown threads, paler towards the ends. Spores brownish purple, closely spinulose, 8 to 10mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

5. **C. pulchella** (Bab.) Rost. Sporangia ovoid or cylindrical, very small, 1 to 2mm. high, scattered, reddish brown, stalked. Stalk short, stout, black. Columella reaching nearly to the apex of the sporangium. Capillitium a network of flexuous brown anastomosing threads, looped at the surface and with a few free ends. Spores pale lilac brown, minutely warted. 6 to 8mmm. in diam.

(Lorain Co.—Oberlin College Herbarium).

Var. 1.—*tenerrima* (Curt.) Lister. Sporangia shortly cylindrical. Stalks 0.5 to 1.5mm. high. Spores and slender capillitium flesh colored.

(Miami Valley—Morgan).

Var. 2.—*gracilis* (Wing.) Lister. Sporangia narrowly cylindrical. Stalks 0.2 to 0.5mm.high. Capillitium threads usually uniting to form a close

uneven surface net. Spores violet gray, very faintly warted, 5 to 7mmm. in diam.

(Ohio—Macbride).

6. **C. typhoides** (Bull.) Rost. Sporangia gregarious, cylindrical, obtuse, at first silvery from the presence of the evanescent wall, then reddish brown, 2 to 3mm. high, stalked. Stalk black, one-third the total height. Columella reaching nearly to the apex of the sporangium. Capillitium a close network of flexuous pale brown threads springing from all parts of the columella, the ultimate branches free or forming an uneven net in the lower part. Spores brown, marked by 4 or 5 prominent warts on the visible hemisphere, 6 to 7mmm. in diam.

Common everywhere on rotten logs.

Var. 1—*microspora* Lister. Sporangia with surface net very close and flexuous. Spores nearly smooth, 3.5 to 4.5mmm. in diam.

(Ohio—Lister). On dead leaves.

3. ENERTHENEMA Bowman.

Enerthenema papillatum (Pers.) Rost. Plate V, Fig. 3.

Sporangia gregarious, stalked. Stalk extending entirely thru the sporangium as a columella. The apex of the columella is expanded into a disc and from this the capillitium arises.

1. **E. papillatum** (Pers.) Rost. Sporangia gregarious, globose, 0.5 to 0.75mm. in diam., black or purple brown. Sporangium wall evanescent. Stalk conical, black. Columella traversing the sporangium and expanding at the apex into a shining disc 1 to 2mm. in diam. Capillitium springing from the edge of the disc as long slender black sparingly branched threads. Spores brown, minutely roughened, 8 to 10mmm. in diam.

Hocking Co., (Cuyahoga Co.—Lloyd Herbarium), (Miami Valley—Morgan), (Ohio—Macbride).

4. LAMPRODERMA Rost.

Lamproderma violaceum (Fr.) Rost. Plate V, Fig. 6.

Sporangia globose or ellipsoid, stalked. Wall iridescent, shining. Stalk black, penetrating the sporangium about half way as a columella. Capillitium consisting of branched anastomosing threads, radiating chiefly from the apex of the columella.

A. Capillitium arising from the apex of the columella in a few branches.
1. *L. arcyrionema*

A. Capillitium arising from the apex of the columella in very numerous branches.
B. Tips of branches colored.
2. *L. scintillana*
B. Tips of branches hyaline.
C. Stalk 1mm. or less long.
D. Spores 8 to 10mmm. in diam.
3. *L. violaceum*
D. Spores 11 to 15mmm. in diam.
4. *L. sauteri*
C. Stalk more than 1mm. long.
5. *L. columbinum*

1. **L. arcyrionema** Rost. Sporangia gregarious, globose, 0.5mm. in diam., steel gray, blue, or bronze, iridescent, stalked, erect. Sporangium wall membranous, falling away in large fragments. Stalk long, slender, black, shining. Columella, slender, reaching to one-third or more the height of the sporangium where it divides into a few branches. Capillitium of purple brown threads arising from the apex of the columella, and frequently branching and anastomosing to form an intricate network with short free tips. Spores light violet, nearly smooth, 6 to 7mmm. in diam.

Southwestern Ohio. (Lorain Co.—Oberlin College Herbarium).

2. **L. scintillans** (Berk. & Br.) Lister. Sporangia scattered or gregarious, globose, 0.3 to 0.5mm. in diam., steel blue or bronze, iridescent, stalked, erect. Sporangium wall membranous, falling away in large fragments. Stalk long, slender, black, shining, rising from a small circular hypothallus. Columella cylindrical, black, not reaching the center of the sporangium. Capillitium dense of sparingly branched and anastomosing rigid brown threads, pale at the base, and with rigid colored free tips. Spores violet, roughened with scattered warts, 7 to 8mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride), (Ohio—Lister).

3. **L. violaceum** (Fries) Rost. Sporangia scattered or gregarious, subglobose, umbilicate below, 0.4 to 0.9mm. in diam., blue or purple, iridescent, stalked, sometimes sessile. Stalk short, stout, black, rising from a membranous brown hypothallus. Columella black, reaching to about the center of the sporangium. Capillitium of pale or brown flexuous threads branching and anastomosing to form a network, the slender tips colorless. Spores purplish gray, minutely roughened, 8 to 10mmm. in diam.

Rather common.

4. **L. sauteri** Rost. This species is closely related to L. violaceum of which Lister considers it a variety, and it differs from that species in having a darker capillitium and larger and darker spores which are from 12 to 15mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

5. **L. columbinum** (Pers.) Rost. Sporangia gregarious, globose or ellipsoid, 0.5 to 0.8mm in diam., violet or purple with metallic iridescence, stalked, erect. Sporangium wall membranous, persistent. Stalk long, slender, black, shining, arising from a dark purple hypothallus. Capillitium of brownish purple threads arising from nearly all parts of the columella, branching and anastomosing and forming at the surface a delicate nearly colorless network. Spores purple, roughened, 11 to 14mmm. in diam.

(Miami Valley—Morgan).

5. **CLASTODERMA** Blytt.

Clastoderma debaryanum Blytt. Plate V, Fig, 9.

Sporangia distinct, globose, stalked. Columella very short or scarcely evident. Capillitium arising from the short columella in a few sparingly branched threads, which bear at their tips the persistent fragments of the sporangium wall.

1. **C. debaryanum** Blytt. Sporangia gregarious, globose, very small, 0.15 to 0.2mm. in diam., brown, stalked. Sporangium wall persistent in circular or polygonal patches attached to the ultimate branches of the capillitium. Columella very short. Capillitium of pale brown, sparingly branched and anastomosing threads. Spores pale brown, smooth, 7 to 10mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

FAMILY 4. **AMAUROCHAETACEAE.**

Sporangia combined into an aethalium. Capillitium of dark irregular branching threads or of threads with peculiar chambered vesicles.

KEY TO THE GENERA OF AMAUROCHAETACEAE.

A. Capillitium of ragged strands. 1. *Amaurochaete*
A. Capillitium of threads expanding into vesicles. 2. *Brefeldia*

1. **AMAUROCHAETE** Rost.

Amaurochaete fuliginosa (Sowerby) Macbride. Plate V, Fig. 5.

Sporangia combined into an aethalium which is covered by a fragile silvery cortex. Capillitium springing from the base and consisting of numerous erect dark purple ragged strands, which branch and anastomose in a very irregular manner.

1. **A. fuliginosa** (Sowerby) Macbride. Aethalia of various sizes and shapes, black, at first covered with a silvery cortex. Sporangium walls obsolete. Spores dull purple, spinulose, 11 to 13mmm. in diam.

(Miama Valley—Morgan).

2. **BREFELDIA** Rost.

Brefeldia maxima (Fries) Rost. Plate V, Fig. 4.

Aethalium consisting of subcylindrical, somewhat branched and confluent sporangia, rising from a base of spongy barren tissue. Capillitium of numerous horizontal threads, which unite at the surface of the adjacent sporangia to form many chambered vesicles.

1. **B. maxima** (Fries) Rost. Aethalium large, 2 to 30cm. in diam., purple brown. Capillitium consisting of numerous threads radiating from near the center of the sporangium, but free from the columella; the

threads uniting at the boundary of the sporangia to form many chambered vesicles. Spores purple, minutely roughened, 9 to 12mmm. in diam.

While this species may be looked for in Ohio the writer is not aware of its having been reported for the state.

ORDER 3. LICEALES

Sporangia distinct or combined into aethalia. Lime not present. Capillitium wanting or imperfect. Spores generally yellowish in color, never black.

FAMILY 5. LICEACEAE

Sporangia distinct or plasmodiocarpous, sessile or stalked. Sporangium wall without definite thickenings. Capillitium and columella absent.

KEY TO THE GENERA OF LICEACEAE.

A. Sporangia sessile; lid not present.	1. *Licea*
A. Sporangia stalked; lid present.	2. *Orcadella*

1. LICEA Schrader.

Licea biforis Morgan. Plate VI, Figs. 7 and 7a.

Sporangia sessile, distinct or plasmodiocarpous. Sporangium wall single. Capillitium and columella absent. Spores range in color from brown to nearly colorless.

A. Dehiscence of sporangia irregular.	1. *L. flexuosa*
A. Dehiscence of sporangia regular.	
B. Sporangia dehiscing into two lobes.	2. *L. biforis*
B. Sporangia dehiscing into several lobes.	3. *L. pusilla*

1. **L. flexuosa** Pers. Sporangia scattered, depressed, or forming straight, curved, or branching plasmodiocarps 1 to 6mm. long, brown. Sporangium wall cartilaginous, translucent, brown, usually with a closely adhering rough outer layer of opaque refuse matter; dehiscing irregularly. Spores olive brown, spinulose, 11 to 14mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

2. **L. biforis** Morgan. Sporangia scattered, ellipsoid or elongated, very small, 0.1mm. broad, yellow brown, sessile, dehiscing into two lobes. Sporangium wall membranous, minutely papillose. Spores almost colorless smooth, globose or ovoid. 9 to 12mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride.) Probably frequently overlooked as the sporangia are so small that their detection is difficult without the use of a hand lens.

3. **L. pusilla** Schrader. Sporangia scattered, depressed globose, 0.6 to to 1mm. in diam., dark brown, dehiscing into several irregular lobes. Spores olive brown, minutely warted, 16 to 20mmm. in diam.

(Miami Valley—Morgan).

2. **ORCADELLA** Wingate.

Orcadella operculata Wing. Plate VI, Fig. 6.

Sporangia subglobose, stalked; opening by a distinct membranous lid.

1. **O. operculata** Wing. Sporangia scattered, urn shaped, or subglobose, very minute, 0.1 to 0.3mm. in diam., dark brown, with a yellow glossy convex lid. Stalk cylindrical, furrowed, dark, filled with refuse matter. Spores nearly colorless, smooth, 8 to 11mmm. in diam.

This very minute species has not been reported from Ohio. Since the type material was collected in Pennsylvania we should expect the species to occur in the state. It has probably been overlooked on account of its minuteness.

FAMILY 6. **CRIBRARCAEAE.**

Sporangia distinct, stalked. Sporangium wall with thickenings in the form of a net or ribs.

KEY TO THE GENERA OF CRIBRARIACEAE.

A. Sporangium wall with thickenings in the form of ribs. 1. *Dictydium*
A. Sporangium wall with thickenings in the form of a net. 2. *Cribraria*

1. **DICTYDIUM** Schrader.

Dictydium cancellatum (Batsch) Macbr. Plate V, Fig. 8.

Sporangia distinct, stalked, globose. Sporangium wall consisting of parallel ribs extending from the base nearly to the apex and connected by slender transverse threads; the thin wall connecting the threads evanescent.

1. **D. cancellatum** (Batsch) Macbride. Sporangia gregarious, globose, 0.5 to 0.7mm. in diam., dark brown or purple, stalked, cernuous. Sporangium wall of numerous rigid longitudinal ribs connected by slender transverse threads, with the thin wall between the threads early deciduous. Sometimes the ribs are replaced by a net in the upper part of the sporangium. Stalk slender, subulate, bent or twisted, dark brown. Spores purple red, minutely roughened, 5 to 7mmm. in diam.

Abundant everywhere on rotten wood.

2. **CRIBRARIA** Persoon.

Cribraria tenella Schrad. Plate V, Fig. 7.

Sporangia globose, stalked. Sporangium wall forming a cup at the base and above a net of delicate threads with expanded nodes. The thin wall connecting the threads being early deciduous.

A. Net without expanded nodes. 1. *C. argillacea*
A. Net with expanded nodes.
  B. Sporangia brown.
    C. Nodes with rounded outline.
      D. Cup wanting or rudimentary.
        E. Cup replaced by ribs. 2. *C. dictydioides*
        E. Cup replaced by the net. 3. *C. microcarpa*

D. Cup present, sometimes wanting in C. tenella.
F. Free rays numerous. 4. *C. intricata*
F. Free rays few or none. 5. *C. tenella*
C. Nodes not rounded.
G. Nodes angular.
H. Cup well defined. 6. *C. aurantiaca*
H. Cup replaced by strong parallel ribs. 7. *C. splendens*
G. Nodes polygonal. 8. *C. languescens*
B. Sporangia purple.
I. Sporongia reddish purple.
J. Sporangia 1mm. in diam. 9. *C. purpurea*
J. Sporangia 0.4mm. in diam. 10. *C. elegans*
I. Sporangia blue purple, very minute, 0.2mm. in diam. 11. *C. violacea*

1. **C. argillacea** Pers. Sporangia crowded, globose, 0.5 to 0.8mm. in diam., clay colored, stalked, sometimes nearly sessile. Cup poorly defined. Sporangium wall sub persistent, with thickened bands forming an irregular net without expanded nodes. Stalk cylindrical, furrowed, dark brown, arising from a well developed hypothallus. Spores pale, minutely roughened, 5 to 6mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

2. **C. dictydioides** Cooke and Balf. Sporangia gregarious, 0.6mm. in diam., dull brown, stalked. Cup almost obsolete; the nodes in the lower part of the net elongated and confluent forming ribs. Nodes numerous, with rounded but often irregular outlines, connected by slender threads and with many free rays. Stalk long, slender. Spores pale brown, nearly smooth, 5 to 6mmm. in diam.

Erie Co., (Ohio—Macbride)., (Licking Co.—Herbarium of Professor Bruce Fink), (Lorain Co.—Oberlin College Herbarium).

3. **C. microcarpa** (Schrad.) Pers. Sporangia gregarious, globose, very small, 0.1 to 0.3mm. in diam., purplish brown, stalked. Cup replaced by a close regular net, the nodes of which are subglobose, prominent, about 10mmm. in diam., and densely charged with dark granules 1 to 2mmm. in diam. The rounded nodes are connected by five or six slender threads. Stalks slender, long, dark brown. Spores pale red minutely roughened. 5 to 6mmm. in diam.

(Miami Valley—Morgan).

4. **C. intricata** Schrad. Sporangia gregarious, globose, 0.5 to 0.7mm, in diam., yellowish brown, stalked, erect or nodding. Cup one-third the height of the sporangium, yellowish brown, with a toothed margin. Net regular with numerous prominent dark brown, rounded, and branching nodes, connected by from five to eight slender threads and with many free rays. Stalk subulate, 1 to 3mm. high, dark brown, spores yellowish brown, nearly smooth, 5 to 6mmm. in diam.

Erie Co., (Miami Valley—Morgan).

5. **C. tenella** Schrad. Sporangia gregarious, globose, 0.6mm. in diam., yellowish brown, stalked. Cup one-third the height of the sporangium or much reduced. Net regular, with numerous prominent dark brown rounded nodes connected by four or five very slender threads and with a few free rays. Spores yellowish brown, nearly smooth, 5 to 6mmm. in diam.

Common.

6. **C. aurantiaca** Schrad. Sporangia gregarious, globose, 0.4 to 0.7mm. in diam., brown, stalked. Cup one-third the height of the sporangium, the margin irregularly and deeply toothed. Nodes of the net broad, flattened, angular, with the angles continued into the slender connecting threads and often into a few free rays. Spores yellowish, smooth, 5 to 6mmm. in diam.

(Miami Valley—Morgan), (Ohio—Macbride).

7. **C. splendens** (Schrad.) Pers. Sporangia scattered, globose, 0.3mm. in diam., brown, stalked, erect or inclined. Sporangium wall consisting in the lower half of about nine free ribs with little trace of a persistent cup, continued into a loose net with small, often triangular, nodes. Stalk slender, brown, four or five times the length of the sporangium. Spores pale, almost smooth, 5 to 6mmm. in diam.

Cuyahoga Co.

8. **C. languescens** Rex. Sporangia scattered, globose, very small, .25 to .35mm. in diam., reddish brown, stalked, drooping. Cup one-third the height of the sporangium, reddish brown, shining, minutely striated with granular lines; the margin toothed. Nodes of the net dark brown, polygonal, with slender connecting threads and a few free rays. Stalk very slender, subulate, brown. Spores pale red, nearly smooth, 5 to 6mmm. in diam.

Apparently rather common.

9. **C. purpurea** Schrad. Sporangia gregarious, globose, 1mm. in diam., reddish purple, stalked, erect or inclined. Cup one-third the height of the sporangium with a deeply toothed margin. Net of slender threads with irregular meshes, and few expanded nodes. Stalk slender, furrowed, 1.5mm. long, purple black. Spores purplish, nearly smooth, 5 to 6mmm. in diam.

(Ohio—Macbride).

10. **C. elegans** Berk. and Curt. Sporangia gregarious, globose, 0.3 to 0.4mm. in diam., reddish purple, stalked, erect or inclined. Cup one-half the height of the sporangium with a deeply toothed margin. Net of slender threads connecting numerous flat expanded and branched nodes. Stalk slender, smooth, dark. Spores pale violet, nearly smooth, 5 to 6mmm. in diam.

(Miami Valley—Morgan).

11. **C. violacea** Rex. Sporangia gregarious, globose or ellipsoid, very minute, 0.2mm. in diam., bluish purple, stalked, erect or slightly inclined. Cup from one-third to two-thirds the height of the sporangium, with a toothed margin. Net of slender threads connecting flat, broadly expanded, angular nodes. Stalk long, slender, subulate, dark. Spores lilac, minutely roughened, 7 to 8mmm. in diam.

(Hamilton Co.— Lloyd Herbarium).

FAMILY 7. **TUBIFERACEAE.**

Sporangia closely compacted or combined into an aethalium. Sporangia well defined, tubular, lateral walls usually entire. Capillitium wanting

KEY TO THE GENERA OF TUBIFERACEAE.

A. Sporangium wall containing clusters of dark plasmodic granules. 1. *Lindbladia*
A. Sporangium wall without plasmodic granules. 2. *Tubifera*

1. **LINDBLADIA** Fries.

Lindbladia effusa (Ehrenb.) Rost. Plate VI, Figs. 5, 5a, and 5b.

Sporangia combined into an aethalium, sometimes distinct when the sporangia may be sessile or stalked. Sporangium wall membranous, studded with clusters of dark microscopic granules.

1. **L. effusa** (Ehrenb.) Rost. Sporangia minute, combined into an aethalium 2 to 10mm. thick, brown or black. Sporangium wall membranous, entire or perforated, containing clusters of dark microscopic plasmodic granules. Spores ochraceous brown, nearly smooth, 5 to 6mmm. in diam.

Erie Co., (Miami Valley—Morgan), (Ohio—Lister.

2. **TUBIFERA** Gmelin.

Tubifera ferruginosa (Batsch) Gmel. Plate VI, Figs. 3 and 3a.
Tubifera stipitata (B. and R.) Macbride. Plate VI, Fig. 4.

Sporangia tubular, crowned on a common hypothallus, opening at the apex. Sporangium wall membranous, brown, without plasmodic granules.

A. Columella absent.
  B. Group of sporangia sessile. 1. *T. ferruginosa*
  B. Group of sporangia on stalk like hypothallus. 2. *T. stipitata*
A. Columella present. 3. *T. casparyi*

1. **T. ferruginosa** (Batsch) Gmel. Sporangia densely crowded, cylindrical, angled by mutual pressure, 3mm. high, about 0.4mm. wide, pale brown. Hypothallus thick, spongy. Sporangium wall membranous, brown. Spores pale rufous brown, minutely reticulated over three-fourths of the surface, 5 to 8mmm. in diam.

Common.

2. **T. stipitata** (Berk. and Rav.) Macbride. Sporangia clustered in a flat hemispherical mass on a spongy stalk formed of the hypothallus. Spores pale rufous brown, minutely reticulated over the most of the surface, 3 to 5mmm. in diam.

Erie Co., (Cuyahoga Co.—Lloyd Herbarium), (Licking Co.—Oberlin College Herbarium).

3. **T. casparyi** (Rost.) Macbride. This species differs from T. ferruginosa in having a central columella which is connected to the sporangium wall by numerous straight tubular processes. Spores pale, rufous brown, closely reticulated, 6 to 7mmm. in diam.

(Miami Valley—Morgan).

FAMILY 8. RETICULARIACEAE.

Sporangia combined into an aethalium. Sporangium walls incomplete perforated, or frayed into strands which may resemble a capillitium. True capillitium wanting.

KEY TO THE GENERA OF RETICULARIACEAE.

A. Sporangia columnar. — 1. *Dictydiaethalium*
A. Sporangia interwoven.
  B. Walls frayed into strands rising from the hypothallus. — 2. *Reticularia*
  B. Walls perforated with large openings. — 3. *Enteridium*

1. DICTYDIAETHALIUM Rostafinski.

Dictydiaethalium plumbeum (Schum.) Rost. Plate VII, Figs. 5, 5a, 5b, 5c, 5d, and 5e.

Sporangia columnar, combined into a very flat aethalium. Sporangium walls convex at the apex, the lateral walls absent except portions forming several straight threads that run from base to summit. Capillitium absent.

1. **D. plumbeum** (Schum.) Rost. The flat aethalium, about 1mm. thick, is formed of regular erect sporangia, prismatic by mutual pressure. The sporangium wall is convex above and extends to the base in from four to six straight slender threads, the remainder of wall absent. Hypothallus silvery. Spores pale yellow, 9 to 10mmm. in diam.

Cuyahoga Co., (Miami Valley—Morgan).

2. RETICULARIA Bulliard.

Reticularia lycoperdon Bull. Plate VII, Fig. 4.

Interwoven sporangia forming an aethalium. Sporangium walls partly evanescent and partly persistent, forming broad strands which branch above into slender threads, constituting a pseudo-capillitium.

1. **R. lycoperdon** Bull. Aethalium pulvinate, 1 to 8cm. broad, silvery white or dark colored, seated upon a well developed hypothallus. The

pseudo-capillitium, the remains of the sporangium walls, consists of irregular flat branching plates arising from the hypothallus and which give rise above to many slender flattened brown threads. Spores spherical or top shaped, reticulated over the greater part of the surface, warted on the remainder, 6 to 8mmm. in diam.

Erie Co., (Miami Valley—Morgan), (Columbiana Co.—Lloyd Herb.). (Licking Co.—Oberlin College Herbarium).

3. **ENTERIDIUM** Ehrenberg.

Enteridium rozeanum Wing. Plate VII, Figs. 3, 3a, and 3b.

Confluent sporangia interwoven into an aethalium. Sporangium walls perforated by large openings. Capillitium absent.

1. **E. rozeanum** Wing. Aethalium hemispherical or pulvinate, 1 to 5cm. in diam., brown. Sporangium walls perforated by large openings, forming a network of broad membranous bands. Spores brown, reticulated on two-thirds of the surface, the remainder nearly smooth, 7 to 9mmm. in diam.

Erie Co., Cuyahoga Co., (Miami Valley—Morgan), (Ohio—Lister), (Lorain Co.—Oberlin College Herbarium).

ORDER 4. **TRICHIALES.**

Sporangia distinct or combined into aethalia. Lime not present. Capillitium present consisting of threads, tubular or solid, smooth, wrinkled, or variously sculptured.

FAMILY 9. **MARGARITACEAE.**

Sporangia distinct, usually sessile. Sporangium wall single, smooth, usually translucent. Capillitium consisting of solid threads, either coiled and hair like, or nearly straight and attached to the sporangium walls, simple or branching at an acute angle.

A small family of Slime Molds with the few species distributed among four genera, none of which have been reported from Ohio. The two following are the only American forms.

Dianema harveyi Rex; having small sessile bronze colored sporangia and a capillitium consisting of straight slender threads, unsculptured and attached both above and below to the sporangium wall has been found in Maine.

Prototrichia metallica (Berk.) Mass. is found in our Pacific Coast States and differs from Dianema in having the threads of the capillitium stout and marked by from two to four spiral bands.

FAMILY 10. LYCOGALACEAE.

Sporangia combined into an aethalium. Capillitium consisting of smooth or wrinkled colorless branching tubes. A family of few species all in the genus Lycogala.

1. LYCOGALA Adanson.

Lycogala epidendrum (L.) Fr. Plate VI, Figs. 1, 1a, and 1b.
Lycogala flavo-fuscum (Ehr.) Rost. Plate VI, Fig. 2.

Aethalium subglobose or conical with a tough cortex consisting of two layers. The outer layer contains large vesicles. The capillitium consists of irregular branching wrinkled or nearly smooth tubes attached to the cortex and having numerous rounded free ends.

A. Aethalia large, solitary. 1. *L. flavo-fuscum*
A. Aethalia small, loosely clustered.
  B. Aethalia globose. 2. *L. epidendrum*
  B. Aethalia conical. 3. *L. conicum*

1. **L. flavo-fuscum** (Ehr.) Rost. Aethalia usually solitary, large, 2 to 5cm. in diam., brown, smooth, shining. Capillitium of large branching nearly colorless smooth or somewhat wrinkled and papillose tubes, with many free ends. Spores colorless, minutely roughened, 5 to 6mmm. in diam.

Undoubtedly a rare species in Ohio. The writer has seen it in the field but once, yet it is reported from a number of localities. The large size and persistent nature of the aethalim causing it to be collected more often than some of the more common Slime Molds.

2. **L. epidendrum** (Linn.) Fries. Aethalia scattered or crowded, subglobose, 2 to 10mm. in diam, dark brown, minutely warted. Capillitium of branching, thin walled, wrinkled tubes. Spores, in mass pink, colorless under the microscope, minutely roughened, 5 to 6mmm. in diam.

Common everywhere on rotten wood; sometimes found on moist earth.

3. **L. conicum** Pers. Aethalia scattered or crowded, conical, small, 1.5 to 3mm. high, yellow brown, marked by obscure dark reticulations. Capillitium of abundant simple slender gray tubes, seldom branching, almost smooth, the free ends obtuse. Spores nearly colorless, minutely roughened, 4 to 5mmm. in diam.

(Miami Valley—Morgan), (Ohio—Lister).

FAMILY 11. ARCYRIACEAE.

Sporangia distinct, stalked or sessile. Capillitium a network of tubular threads marked by half rings, cogs, or warts.

KEY TO THE GENERA OF ARCYRIACEAE.

A. Capillitium elastic.
A. Capillitium inelastic. 1. *Arcyria*
  B. Sporangia sessile or stalked, not heaped.

C. Dehiscence of sporangia regular. 2. *Perichaena*
C. Dehiscence of sporangia irregular. 3. *Ophiotheca*
B. Sporangia sessile, heaped. 4. *Lachnobolus*

1. **ARCYRIA** Wiggers.

Arcyria cinerea (Bull.) Pers. Plate VII, Fig. 2.
Arcyria nutans (Bull.) Grev. Plate VII, Figs. 1, 1a, 1b, and 1c.

Sporangia ovoid or cylindrical, stalked. Sporangium wall evanescent above, persistent below as a cup. Capillitium an elastic network with the threads variously marked, but not with spiral bands.

A. Mature capillitium greatly expanded and drooping. 1. *A. nutans*
A. Mature capillitium not greatly expanded.
B. Sporangia red or brown.
C. Capillitium free from the cup.
D. Spores 10 to 11mmm. in diam. 2. *A. ferruginea*
D. Spores 6 to 8mmm. in diam. 3. *A. incarnata*
C. Capillitium attached to the cup. 4. *A. denudata*
B. Sporangia yellow, very small. 5. *A. pomiformis*
B. Sporangia gray or white.
E. Sporangia cylindrical.
F. Sporangia single. 6. *A. cinerea*
F. Sporangia combined in clusters. 7. *A. digitata*
E. Sporangia globose. 8. *A. globosa*

1. **A. nutans** (Bull.) Grev. Sporangia clustered, cylindrical, 1 to 2mm. high, light yellow, stalked. Stalk short, weak, buff, filled with spore like cells. Capillitium a very elastic network of pale yellow threads, 3 to 4mmm. in diam., expanding into a long drooping column, nearly free from the cup; the threads marked by sharp spines and half rings arranged in a loose spiral and of scattered warts. Spores pale yellow, nearly smooth, 6 to 8mmm. in diam.

Common.

2. **A. ferruginea** Sauter. Sporangia clustered, ovoid, 0.7 to 1.3mm. high, dull red, sometimes yellow, stalked. Stalk red, filled with spore like cells, and arising from a well developed hypothallus. Capillitium an elastic network of reddish yellow threads, 5 to 6mmm. in diam., smaller toward the base of the sporangium, free from the cup, and marked by conspicuous reticulations; free ends not uncommon. Spores pale red nearly smooth, 8 to 11mmm. in diam.

Var. 1. **heterotrichia** Torrend. Capillitium a dense network with many pointed free ends; threads closely reticulated and spinulose all over, 5 to 8mmm. in diam.

(Miami valley—Morgan).

3. **A. incarnata** Pers. Sporangia crowded, ellipsoid, 1 to 1.5mm. high pink, stalked. Cup membranous, roughened. Stalk weak, short, flesh colored, filled with spore like cells. Capillitium a very loose elastic network

of pale pink threads, free from the cup, sparingly branched, and marked by cogs, half rings, or spines arranged in a loose spiral and of small scattered spinules; free ends more or less numerous. Spores pale pink, nearly smooth, 6 to 8mmm. in diam.

Not uncommon.

4. **A. denudata** (L.) Sheldon. Sporangia crowded or gregarious, ovoid, or short cylindrical, 1 to 2mm. high, varying in color from crimson to brown, stalked. Cup membranous, firm, shining, plaited. Stalk cylindrical, slender, about as long as the sporangium, brown, filled with spore like cells. Capillitium a close elastic network of pale red threads, firmly attached to the cup and with few or no free ends; threads marked by prominent cogs or spines and half rings arranged in a loose spiral. Spores pale red, nearly smooth, 6 to 8mmm. in diam.

One of our most abundant Slime Molds, being found everywhere on rotten logs and sticks.

5. **A. pomiformis** (Leers) Rost. Sporangia scattered, subglobose, or ovoid, small, yellow, stalked. Stalk slender, buff, one-third mm. high, filled with spore like cells. Capillitium a loose network of yellow threads about 3mmm. in diam., marked by transverse bands and spines arranged in an open spiral. Spores nearly colorless, slightly warted, 7 to 8mmm. in diam.

Cuyahoga Co., Hocking Co., Lucas Co.

6. **A. cinerea** (Bull.) Pers. Sporangia gregarious or scattered, cylindrical or ovoid, from 1 to 3mm. high, ashen gray, sometimes yellowish, stalked. Stalk cylindrical, furrowed, about equal to the sporangium in length. Capillitium a close network of pale yellow threads, firmly attached to the cup; the threads, 2 to 4mmm. in diam., are marked with warts or spines except near the base of the sporangium where they are larger and smoother. Spores nearly colorless, slightly warted, 6 to 8mmm. in diam.

Common everywhere on logs and sticks.

7. **A. digitata** (Schw.) Rost. Sporangia in clusters of from 3 to 12, the stalks being united. Sporangia cylindrical, 3 to 4mm. high, otherwise as A. cinerea of which it is considered by some a variety.

Not uncommon.

8. **A. globosa** Schwein. Sporangia scattered or gregarious, globose, 0.5mm. in diam., white or pale yellow, stalked. Stalk slender, yellowish, filled with spore like cells. Capillitium a close network, slightly elastic, of colorless threads 2 to 4mmm. in diam., marked with warts or spines usually in spirals. Spores colorless, slightly warted, 6 to 8mmm. in diam.

On the male catkins and spines of fallen burrs of the Chestnut. Not uncommon in the parts of the state where this tree is found.

2. **PERICHAENA** Fries.

Perichaena depressa Lib. Plate VIII, Figs. 3, 3a, and 3b.

Sporangia flat or depressed globose. Sporangium wall double, the outer layer containing angular granules of dark refuse material. Capillitium of slender, simple or branched, yellow threads, minutely warted or nearly smooth. Spores yellow, minutely warted.

A. Sporangia flat. 1. *P. depressa*
A. Sporangia depressed globose. 2. *P. corticalis*

1. **P. depressa** Libert. Sporangia crowded, polygonal by mutual pressure, flat, 0.5 to 1mm. in diam., brown, dehiscing by a definite lid. Capillitium a network composed of abundant slender yellow threads of variable width, minutely warted. Spores yellow, minutely warted, 10 to 12mmm. in diam.

Common. Upon and under bark of logs and dead trees.

2. **P. corticalis** (Batsch) Rost. Sporangia gregarious, depressed globose, 0.5 to 1mm. in diam., purple brown, dehiscing by a more or less definite lid. Capillitium scanty, of slender weak yellow threads of variable width, minutely warted. Spores yellow, minutely warted, 11 to 14mmm. in diam.

Common. On bark of logs and dead trees.

3. **OPHIOTHECA** Currey.

Ophiotheca chrysosperma Currey. Plate VIII, Figs. 4, 4a, and 4b.

Sporangia globose, sessile, or generally forming slender curved, or ring shaped plasmodiocarps. Sporangium wall double, the outer layer containing granular matter. Capillitium a network of threads with many free ends, and marked by spines or warts.

A. Capillitium spinous. 1. *O. chrysosperma*
A. Capillitium warted. 2. *O. vermicularis*

1. **O. chrysosperma** Currey. Sporangia subglobose or forming curved and ring shaped plasmodiocarps, 0.5 to 1mm. in diam., brown, sessile. Capillitium abundant, of spinous branching threads variable in size and with irregular constrictions. Spores yellow, minutely warted, 9 to 10mmm. in diam.

Common on bark of fallen trees.

2. **O. vermicularis** (Schw.) Macbr. Sporangia scattered, globose or forming slender curved plasmodiocarps about 0.5mm. in diam., dull gray, sessile. Capillitium abundant of yellow branching warted threads 2 to 4mmm. in diam. and having irregular constrictions. Spores yellow, minutely warted, 10 to 15mmm. in diam.

On dead herbaceous stems. Apparently not common. Cuyahoga Co. (Miami Valley—Morgan), (Ohio—Macbride).

4. **LACHNOBOLUS** Fries.

Sporangia closely clustered or heaped, sessile. Sporangium wall single, without granular matter. Capillitium an inelastic network of threads, closely warted.

1. **L. congestus** (Somm.) Lister. Sporangia clustered or heaped, subglobose, 0.5 to 1mm. in diam., yellowish, shining. Sporangium wall single, not containing granular matter. Capillitium an inelastic network of flaccid yellow threads of varying diameter, prominently warted. Spores light yellow, warted, 6 to 8mmm. in diam.

Erie Co.

FAMILY 12. **TRICHIACEAE.**

Sporangia distinct, stalked or sessile. Capillitium consisting of tubular threads combined into a network or of free threads (elaters) marked by spiral bands or thickenings.

KEY TO THE GENERA OF TRICHIACEAE.

A.	Capillitium united into a network.	
	C. Capillitium marked by imperfect spiral thickenings.	1. *Calonema*
	C. Capillitium marked by spiral thickenings.	2. *Hemitrichia*
A.	Capillitium of free unbranched threads.	
	B. Elaters with imperfect spiral thikenings.	3. *Oligonema*
	B. Elaters with spiral thickenings.	4. *Trichia*

1. **CALONEMA** Morgan.

Calonema aureum Morgan. Plate VIII, Figs. 2, 2a, and 2b.

Sporangia crowded or heaped, subglobose, sessile. Capillitium a network of slender threads marked by imperfect spiral thickenings or by rings.

1. **C. aureum** Morgan. Sporangia crowded or heaped, 0.3 to 0.6mm. in diam., yellow, shining, sessile. Sporangium wall membranous, translucent, with thin spots from which lines radiate in all directions. Capillitium consisting of branching yellow threads which form an imperfect net, the free ends enlarged, and the threads marked by imperfect spirals and complete rings. Spores yellow, reticulated, 13 to 15mmm. in diam.

Erie Co., (Miami Valley—Morgan), (Ohio—Lister), (Ohio—Macbride.)

2. **HEMITRICHIA** Rostafinski.

Hemitrichia clavata (Pers.) Rost. Plate IX, Figs. 2, 2a, and 2b.
Hemitrichia serpula (Scop.) Rost. Plate IX, Fig. 3.
Hemitrichia vesparium (Batsch) Macbride. Plate IX, Figs. 1, and 1a.

Sporangia distinct, stalked or sessile. Capillitium a network of threads marked by spiral bands. Free ends few or numerous. Spores warted or reticulated.

A. Sporangia sessile.
  B. Spores reticulated. 1. *H. serpula*
  B. Spores minutely warted.
    C. Spiral bands prominent. 2. *H. abietina*
    C. Spiral bands indistinct. 3. *H. karstenii*
A. Sporangia stalked.
  D. Sporangia clustered. 4. *H. vesparium*
  D. Sporangia scattered.
    E. Stalk solid.
      F. Capillitium with spines. 5. *H. intorta*
      F. Capillitium without spines. 6. *H. leiotricha*
    E. Stalk hollow but filled with spore like cells. 7. *H. clavata*

1. **H. serpula** (Scop.) Rost. Sporangia forming elongated branched and reticulated plasmodiocarps, 0.4 to 0.6mm. wide yellow, or rusty in color. Capillitium a loose tangle of long yellow threads sparingly branched, marked by from three to five well defined regular spiral bands, spinulose or smooth. Spores yellow, reticulated, 10 to 12mmm. in diam.

(Hamilton Co.—Lloyd Herbarium), (Licking Co.—Oberlin College Herbarium).

2. **H. abietina** (Wigand) Lister. Sporangia gregarious, subglobose or turbinate, about 0.5mm. in diam., yellow, sessile, sometimes with short stalks. Sporangium wall thin, yellow, persistent below as a cup. Capillitium consisting of twisted, sparingly branched, yellow threads 5 to 6mmm. in diam., marked by from one to three prominent and irregular spiral bands; free ends swollen and rounded. Spores yellow, minutely warted, 10 to 11mmm. in diam.

Medina Co., (Ohio—Macbride).

3. **H. karstenii** (Rost.) Lister. Sporangia subglobose or forming elongated curved plasmodiocarps, 0.25 to 0.5mm. broad, reddish brown, sessile. Capillitium a network of dull red threads. marked by indistinct spiral bands and with prominent ring shaped thickenings or irregular expansions. Spores yellow, minutely warted, 9 to 15mmm. in diam.

Cuyahoga Co.

4. **H. vesparium** (Batsch) Macbride. Sporangia clustered, clavate or subcylindrical, 0.5 to 0.7mm. in diam., dark red, shining, stalked or sessile. Stalks solid, several usually joined together, red, furrowed. Capillitium an imperfect net of twisted sparingly branched, orange red threads, marked by from three to five spiral bands, prominently spinulose, free ends pointed. Spores orange red, warted, 10 to 11mmm. in diam.

Common on rotten logs.

5. **H. intorta** Lister. Sporangia scattered, turbinate, 0.3 to 0.7mm. in diam., orange yellow, shining, stalked. Stalk solid, furrowed, purplish brown. Capillitium a tangled mass of sparingly branched orange yellow

threads, 4mmm. in diam., marked by four or five regular spiral bands, spinulose. Spores yellow, minutely warted, 9 to 10mmm. in diam.

Common.

6. **H. leiotricha** (Cke.) Lister. Sporangia scattered, subglobose, 0.5 to 0.9mm. in diam., dull yellow, shining, stalked. Stalk solid, dark brown. Capillitium a tangled mass of sparingly branched smooth yellow threads, marked by faint spiral bands. Spores dull yellow, minutely warted, 9 to 13mmm. in diam.

Cuyahoga Co.

7. **H. clavata** (Pers.) Rost. Sporangia scattered or gregarious, clavate, or turbinate, 0.7 to 1.5mm. in diam, yellow, shining, stalked. Sporangium wall evanescent above, persistent below as a cup. Stalk hollow filled with spore like cells, brown or dark colored. Capillitium variable, of more or less branching yellow threads, marked by five or six prominent spiral bands, generally smooth. Spores pale yellow, minutely warted, 8 to 10mm. in diam.

Abundant everywhere on logs, sticks, and bark.

3. OLIGONEMA Rostafinski.

Oligonema nitens (Lib.) Rost Plate VIII, Figs. 1, 1a, and 1b.

Sporangia distinct, clustered, minute. Capillitium scanty, marked by scattered rings and faint imperfect spirals or merely warted.

A. Sporangia globose. 1. *O. nitens*
A. Sporangia ovoid. 2. *O. flavidum*

1. **O. nitens** (Libert) Rost. Sporangia clustered in small heaps, subglobose, 0.2 to 0.4mm. in diam., yellow, shining. Sporangium wall without granular matter. Capillitium of short, simple or branched, yellow elaters, smooth or marked by irregular and indistinct spiral bands, sometimes with ring shaped thickenings. Spores yellow, irregularly reticulated, 12 to 14mmm. in diam.

Common on old logs.

2. **O. flavidum** Peck. Sporangia crowded or heaped, ovoid, 0.3 to 0.6mm. in diam., yellow, shining. Sporangium wall with minute granular thickenings arranged in fan like lines. Capillitium of short or long, simple or branched yellow elaters, marked by warts arranged in irregular spirals, and without regular spiral bands. Spores yellow, regularly reticulated, 12 to 13mmm. in diam.

Common.

4. TRICHIA Haller.

Trichia decipens (Pers.) Macbr. Plate IX, Figs. 6, 6a, and 6b.
Trichia flavoginea (Batsch) Pers. Plate IX, Figs. 5, and 5a.
Trichia scabra Rost. Plate IX, Figs. 4, and 4a.
Trichia varia (Pers.) Rost. Plate IX, Figs. 7, and 7a.

Sporangia distinct, stalked or sessile. Capillitium consisting of free threads, called elaters, with pointed ends and marked by spiral bands either smooth or spinulose. Spores yellow, warted or reticulated.

A. Sporangia sessile.
  B. Spirals of elaters three or more.
    C. Spores with border.
      D. Border 2mmm. wide. — 1. *T. favoginea*
      D. Border 1mmm. wide. — 2. *T. persimilis*
    C. Spores without border.
      E. Spores reticulated. — 3. *T. scabra*
      E. Spores warted. — 4. *T. inconspicua*
  B. Spirals of elaters two. — 5. *T. varia*
A. Sporangia stalked.
  F. Elaters spinulose. — 6. *T. erecta*
  F. Elaters smooth.
    G. Sporangia shining, yellow or brown. — 7. *T. decipiens*
    G. Sporangia dull, dark or black. — 8. *T. botrytis*

1. **T. favoginea** (Batsch) Pers. Sporangia crowded on a membranous hypothallus, obovoid, or globose, 0.6 to 0.7mm. in diam., yellow, sessile. Elaters long, even, yellow, 7 to 8mmm. in diam., with four or five spiral bands, smooth or spinulose; the spirals connected by light longitudinal ridges, the ends of the elaters conical, terminating in a smooth point. Spores yellow, prominently and coursely reticulated, giving a border 1.6 to 2mmm. wide, 12 to 15mmm. in diam.

Common on rotten wood.

2. **T. persimilis** Karst. Sporangia crowded, on a membranous hypothallus, globose, 0.5 to 0.8mm in diam., dark yellow, shining, sessile. Elaters 6 to 8mmm. in diam., marked with four spiral bands, usually spinulose; the ends of the elaters conical, acute or with the spiral bands produced outward at the end into sharp divergent spines. Spores yellow, irregularly reticulated, giving a broken border 11 to 14mmm. in diam.

Common on rotten wood.

3. **T. scabra** Rost. Sporangia crowded upon a membranous hypothallus, globose, 0.6 to 0.9mm. in diam., orange yellow or brown, shining, sessile. Elaters long, 4 to 6mmm. in diam., bright yellow, marked by four or five spinulose spiral bands; the ends conical, acute, or with the bands produced into slender divergent points at the ends. Spores yellow, closely reticulated, without a border, 9 to 12mmm. in diam.

Common.

4. **T. inconspicua** Rostafinski. Sporangia crowded or gregarious, subglobose, 0.5 to 0.6mm. in diam., dull red–brown, sessile. Hypothallus absent. Elaters long, simple or branched, slender, 3 to 5mmm. in diam. with four or five distinct and regular spiral bands; often swollen behind the

gradually tapering pointed ends. Spores yellow, minutely warted, 10 to 12mmm. in diam.

Common.

5. **T. varia** Pers. Sporangia gregarious or crowded, globose, ovoid, or sometimes forming plasmodiocarps, 0.6 to 0.9mm. in diam., light yellow, or ochraceous, sessile or sometimes with short stalks. Elaters long, yellow, 3 to 5mmm. in diam., marked by two prominent but irregular spiral bands, and with curved pointed ends. Spores yellow, minutely warted, 11 to 16mmm. in diam.

Rather common.

6. **T. erecta** Rex. Sporangia scattered, globose, 0.5 to 0.7mm. in diam., yellow, mottled with brown angular patches, stalked. Stalk dark brown, opaque. Elaters bright yellow, 3 to 4mmm. wide, marked by four spinulose spiral bands, and with short tapering ends. Spores yellow, minutely warted, 11 to 13mmm. in diam.

Hocking Co.

7. **T. decipiens** (Pers.) Macbride. Sporangia gregarious, turbinate, 0.6 to 0.8mm. in diam., shining olive or yellow brown, stalked. Stalk dark brown, furrowed, filled with spore like cells. Elaters olive brown 4 to 5mmm. in diam., marked by four or five smooth spiral bands and gradually tapering into long slender points. Spores pale brown, minutely roughened, 9 to 12mmm. in diam.

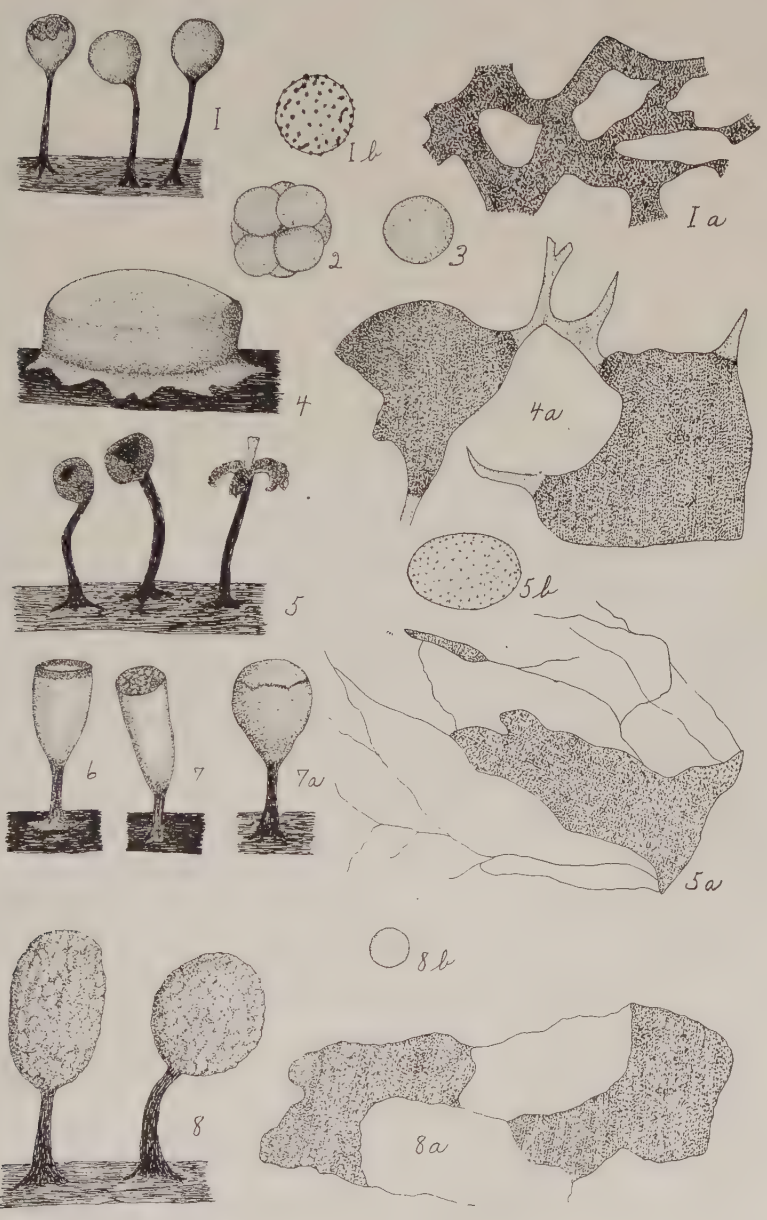
Cuyahoga Co., Summit Co., (Miami Valley—Morgan).

8. **T. botrytis** Pers. Sporangia gregarious, sometimes combined in clusters, pyriform or turbinate, 0.6 to 0.8mm. in diam., dull brown or black, stalked. Stalk brown, furrowed, often combined in clusters of from three to eight. Elaters yellowish brown, 4 to 5mmm. in diam., marked by from three to five spiral bands and gradually tapering to long slender points smooth at the tips. Spore yellow, minutely roughened, 9 to 11mmm. in diam.

(Miami Valley—Morgan). (Ohio—Macbride).

EXPLANATION OF PLATE I.

Badhamia rubigirtnosa (Chev.) Rost.
Fig. 1. Three sporangia X 15.
Fig. 1b. A spore. X 800.
Fig. 1a. A bit of capillitium. X 400.
Badhamia papaveracea Berk.
Fig. 2. A cluster of spores. X 560. (Lister).
Badhamia panicea (Fries.) Rost.
Fig. 3. A single spore. X 800.
Fuligo septica (L) Gmel.
Fig. 4. An aethalium. Natural size.
Fig. 4a. A bit of capillitium. X 400.
Physarella oblonga (B. & C.) Morg.
Fig. 5. A group of three sporangia, in one of which the sporangium wall is ruptured and reflexed. X 15.
Fig. 5a. A bit of capillitium. X 400.
Fig. 5b. A single spore. X 800.
Craterium minutum (Leers) Fr.
Fig. 6. A single sporangium. X 25.
Craterium leucocephalum (Pers.) Ditm.
Fig. 7 and 7a. Two sporangia, one of which opened by means of a lid. X 15.
Craterium aureum (Schum.) Rost.
Fig. 8. Two sporangia. X 40.
Fig. 8a. A bit of the capillitium. X 400.
Fig. 8b. A single spore. X 800.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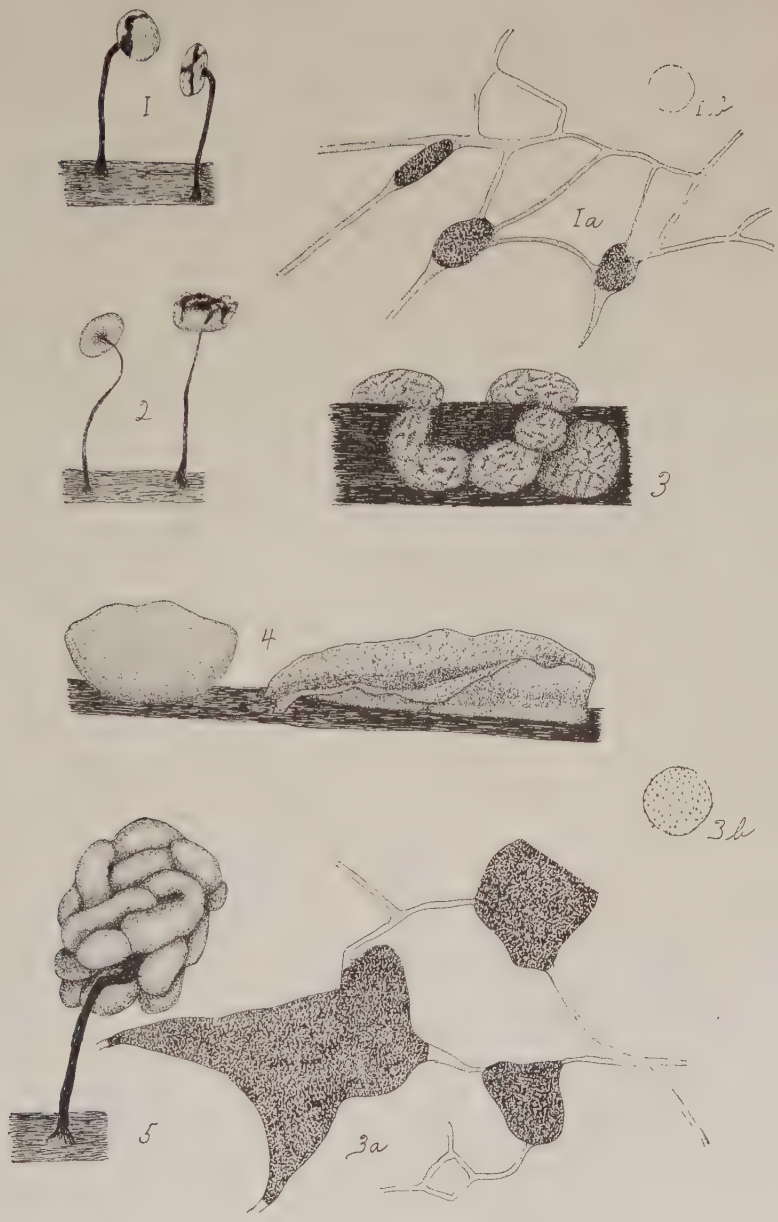
EXPLANATION OF PLATE II.

Physarum viride (Bull.) Pers.
Fig. 1. Two sporangia. X 20.
Fig. 1a. Portion of capillitium in which are three lime knots. X 400.
Fig. 1b. A spore. X 800.
Physarum nutans Pers.
Fig. 2. Two sporangia. X 20.
Physarum vernum Somm.
Fig. 3. A group of sporangia. X 20.
Fig. 3a. Portion of capillitium. X 400.
Fig. 3b. A single spore. X 800.
Physarum sinuosum (Bull.) Weinm.
Fig, 4. Two sporangia, one having ruptures along the upper ridge. X 20.
Physarum polycephalum Schwein.
Fig. 5. A cluster of sporangia. X 20.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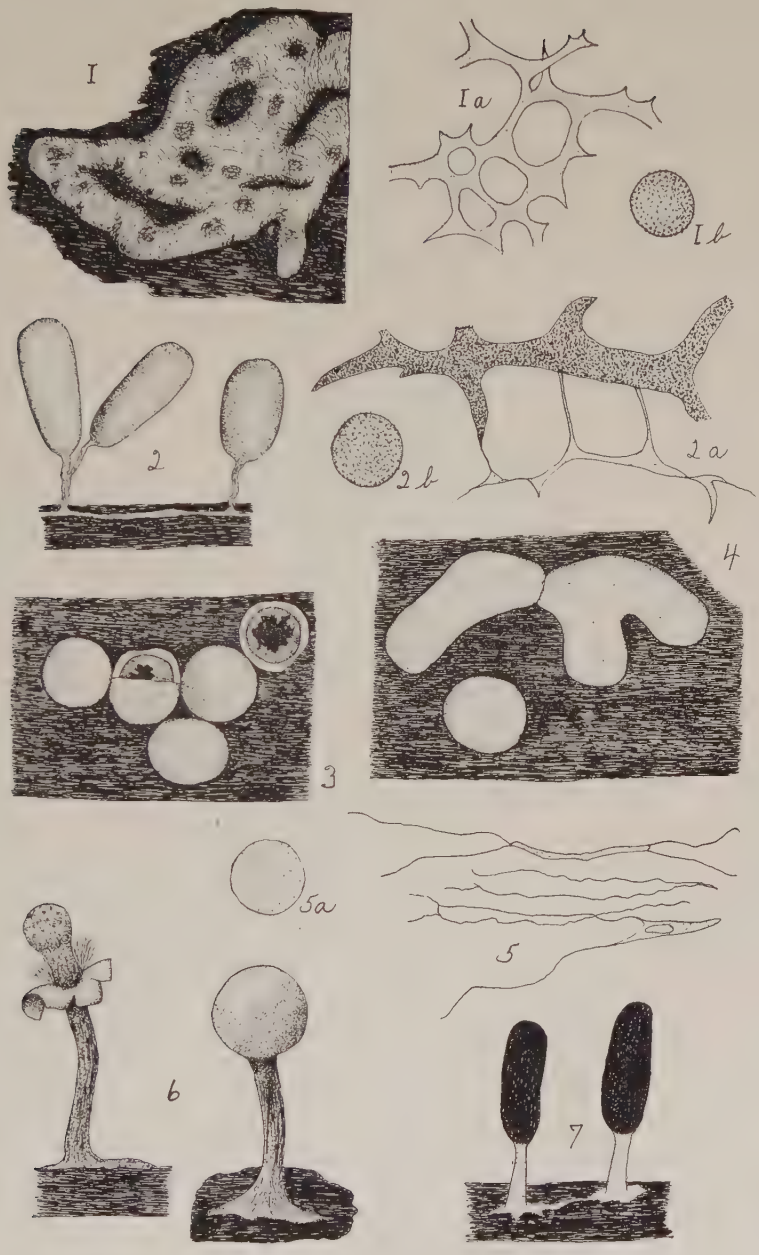
EXPLANATION OF PLATE III.

Cienkowski reticulata (A. & S.) Rost.
Fig. 1. Plasmodiocarp. X 15. (Macbride).
Fig. 1a. A bit of capillitium of the same. X 800. (Macbride.)
Fig. 1b. A single spore. X 1000. (Macbride).
Leocarpus fragilis (Dick), Rost.
Fig. 2. A group of three sporangia. X 15.
Fig. 2a. A bit of capillitum. X 400.
Fig. 2b. A single spore. X 800.
Diderma testaceum (Schrad.) Pers.
Fig. 3. A group of sporangia. X 15.
Diderma effusum (Schwein.) Morgan.
Fig. 4. A group of sporangia. X 15.
Diderma globosum Pers.
Fig. 5. A portion of capillitium. X 400.
Fig. 5a. A single spore. X 800.
Diderma floriforme (Bull.) Pers.
Fig. 6. Two sporangia, the wall of one is broken and reflexed showing the columella. X 20. (Lister).
Diachaea leucopoda (Bull.) Rost.
Fig. 7. Two sporangia. X 20.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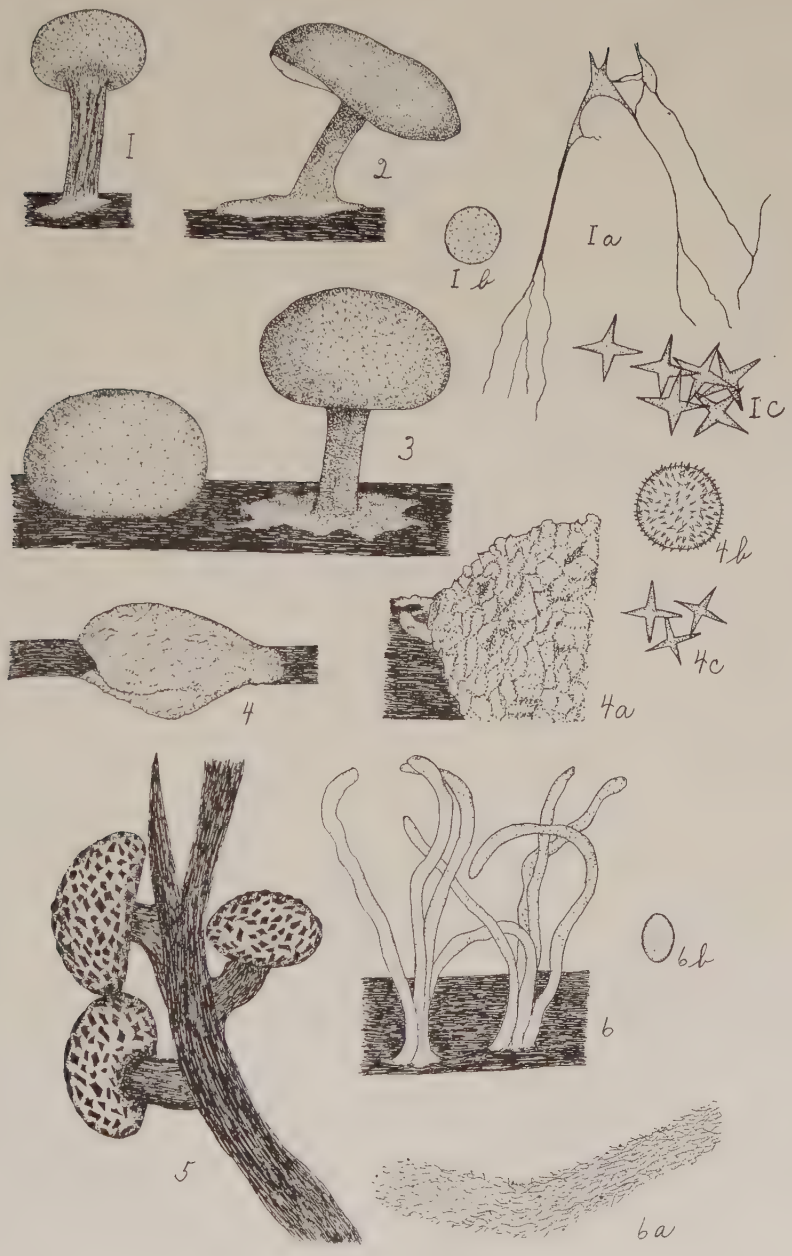
EXPLANATION OF PLATE IV.

Didymium squamulosum (A. & S.) Fr.
Fig. 1. A single sporangium. X 20.
Fig. 1a. A bit of capillitium. X 400.
Fig. 1b. A single spore. X 800.
Fig. 1c. A number of crystals from the surface of spore. X 800.
Didymium clavus (A. & S.) Rost.
Fig. 2. A single sporangium. X 20.
Didymium melanospermum (Pers.) Macbride.
Fig. 3. A stalked and sessile sporangium. X 20.
Mucilago spongiosa (Leysser) Morgan.
Fig. 4. An aethalium. Natural size.
Fig. 4a. Portion of an aethalium. X 10.
Fig. 4b. A single spore. X 800.
Fig. 4c. Crystals from surface of aethalium. X 800.
Lepidoderma tigrinum (Schrad.) Rost.
Fig. 5. A group of three sporangia. X 20. (Lister).
Ceratiomyxa fruticulosa (Muell.) Macbride.
Fig. 6. A group of sporophores. X 40.
Fig. 6a. Tip of a sporophore. X 120.
Fig. 6b. A single spore. X 800.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EXPLANATION OF PLATE V.

Stemonitis splendens Rost.

Fig. 1. A group of sporangia. Natural size. X 40.

Fig. 1a. A portion of a sporangium, showing columella, capillitium and surface net.

Comatrichia irregularis Rex.

Fig. 2. A group of sporangia. X 15.

Fig. 2b. A portion of a sporangium showing columella and capillitium. X 200.

Enerthenema papillatum (Pers.) Rost.

Fig. 3. Two sporangia, the one has shed its spores and shows how the capillitium is attached. X 30.

Brafeldia maxima. (Fr.) Rost.

Fig. 4. Capillitium threads. X 300. (Macbride).

Amaurochaete fuliginosa (Sowerby) Macbride.

Fig. 5. A portion of capillitium. X 300. (Macbride).

Lamproderma violaceum (Fr.) Rost.

Fig. 6. A sporangium after spore dispersal. X 35.

Cribraia tenella Schrad.

Fig. 7. A single sporangium. X 30.

Dictydium cancellatum (Batsch) Macbride.

Fig. 8. A single sporangium. X 40.

Clastoderma debaryanum Blytt.

Fig. 9. A sporangium after spore dispersal. X 280. (Lister)

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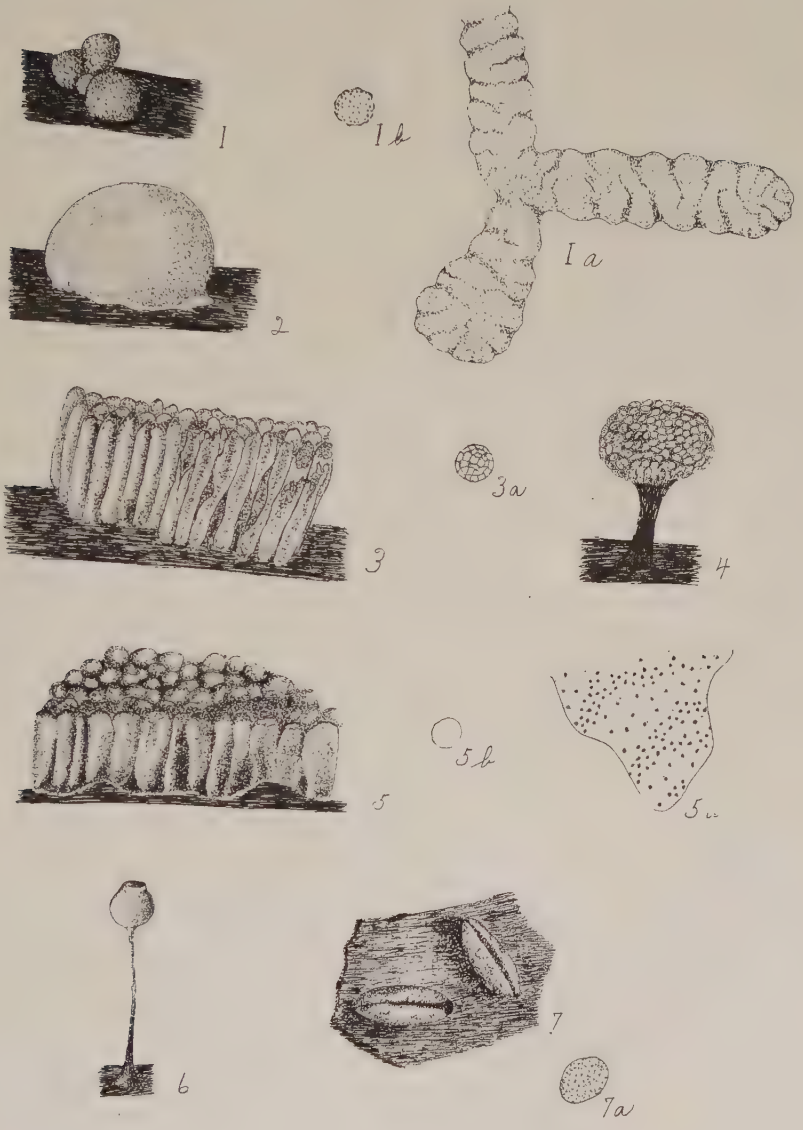
EXPLANATION OF PLATE VI.

Lycogala epidendrum (L.) Fr.
Fig. 1. Four aethalia. Natural size.
Fig. 1a. A bit of capillitium. X 400.
Fig. 1b. A spore. X 800.
Lycogala flavo-fuscum (Ehr.) Rost.
Fig. 2. An aethalium. Natural size.
Tubifera ferruginosa (Batsch) Gmel.
Fig. 3. A group of sporangia. X 6.
Fig. 3a. A single spore. X 800.
Tubifera stipitata (B. & R.) Macbride.
Fig. 4. A group of sporangia upon pedicel. X 6.
Lindbladia effusa (Ehr.) Rost.
Fig. 5. A group of sporangia. X 8.
Fig. 5a. A bit of sporangium wall. X 500.
Fig. 5b. A spore. X 800.
Orcadella operculata Wing.
Fig. 6. A single sporangium. X 30. (Macbride).
Licea biforis Morgan.
Fig. 7. Two sporangia. X 30. (Lister).
Fig. 7a. A spore. X 600. (Lister).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EXPLANATION OF PLATE VII.

Arcyria nutans (Bull) Grev.

Fig. 1. A broken sporangium showing cup and greatly expanded capillitium. X 10.

Fig. 1a. Portion of capillitium showing network.

Fig. 1b. Small portion of capillitium. X 400.

Fig. 1c. A spore. X 800.

Arcyria cinerea (Bull.) Pers.

Fig. 2. A sporangium with entire wall.

Enteridium rozeanum Wing.

Fig. 3. An aethalium. Natural size.

Fig. 3a. Network formed by sporangium walls. X 40.

Fig. 3b. A spore. X 800.

Reticularia lycoperdon Bull.

Fig. 4. Strands or so called capillitium from a broken aethalium. X 8.

Dictydiaethalium plumbeum (Schum.) Rost.

Fig. 5. An aethalium. X 15.

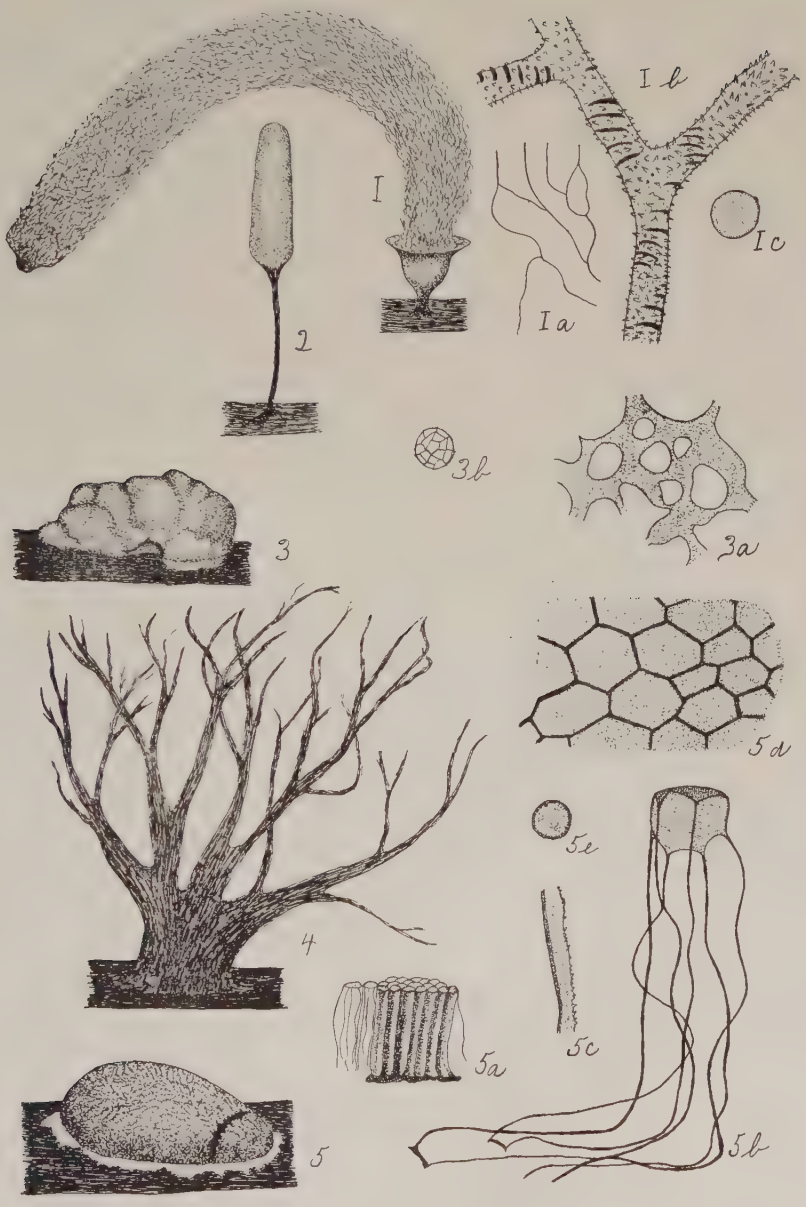
Fig. 5a. A few sporangia from an aethalium. X 20. (Lister).

Fig. 5b. A cap and threads of a sporangium wall. X 50. (Lister).

Fig. 5c. Portion of a thread. X 280. (Lister).

Fig. 5d. Portion of floor of aethalium areolated with the bases of the sporangia. X 50. (Lister).

Fig. 5e. A spore. X 600. (Lister).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EXPLANATION OF PLATE VIII.

Oligonema nitens (Lib.) Rost.

Fig. 1. A group of sporangia. X 16.

Fig. 1a. An elater. X 400.

Fig. 1b. A spore. X 800.

Calonema aureum Morgan.

Fig. 2. A portion of the sporangium wall. X 400.

Fig. 2a. A portion of the capillitium. X 400.

Fig. 2b. A spore. X 800.

Perichaena depressa Lib.

Fig. 3. A group of sporangia. X 20.

Fig. 3a. A capillitium thread. X 400.

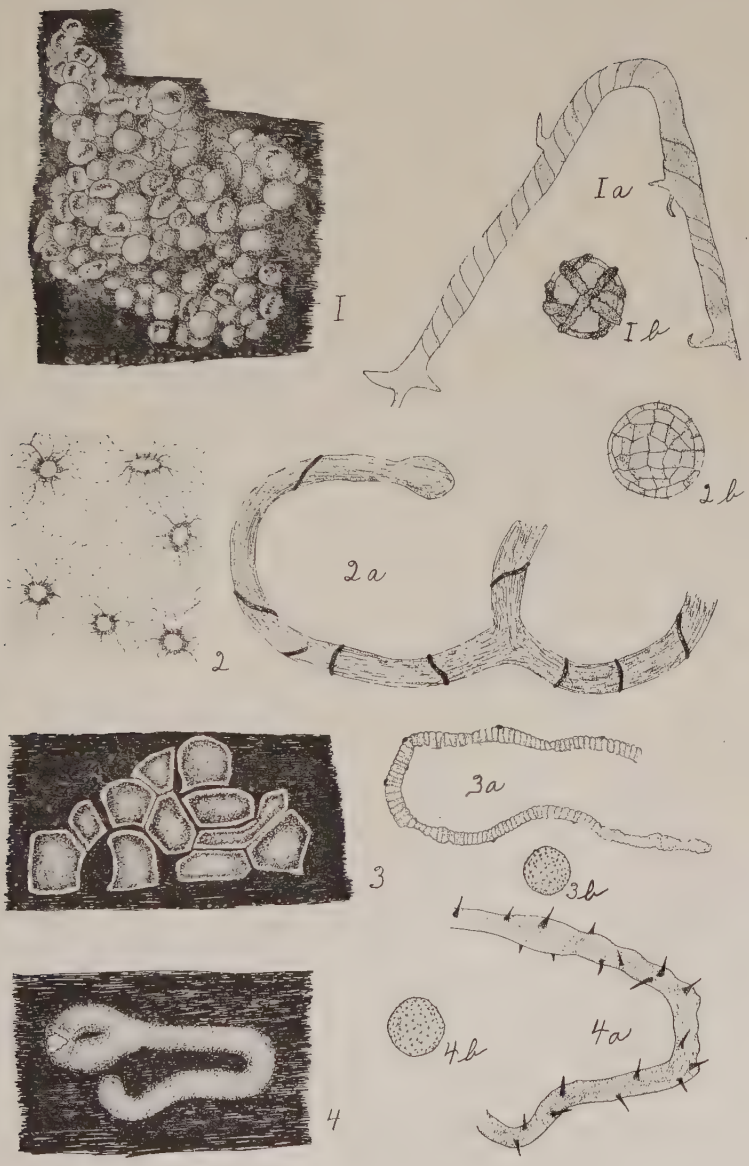
Fig. 3b. A spore. X 800.

Ophiotheca chrysosperma Currey.

Fig. 4. A plasmodiocarp. X 20.

Fig. 4a. A portion of the capillitium. X 400.

Fig. 4b. A spore. X 800.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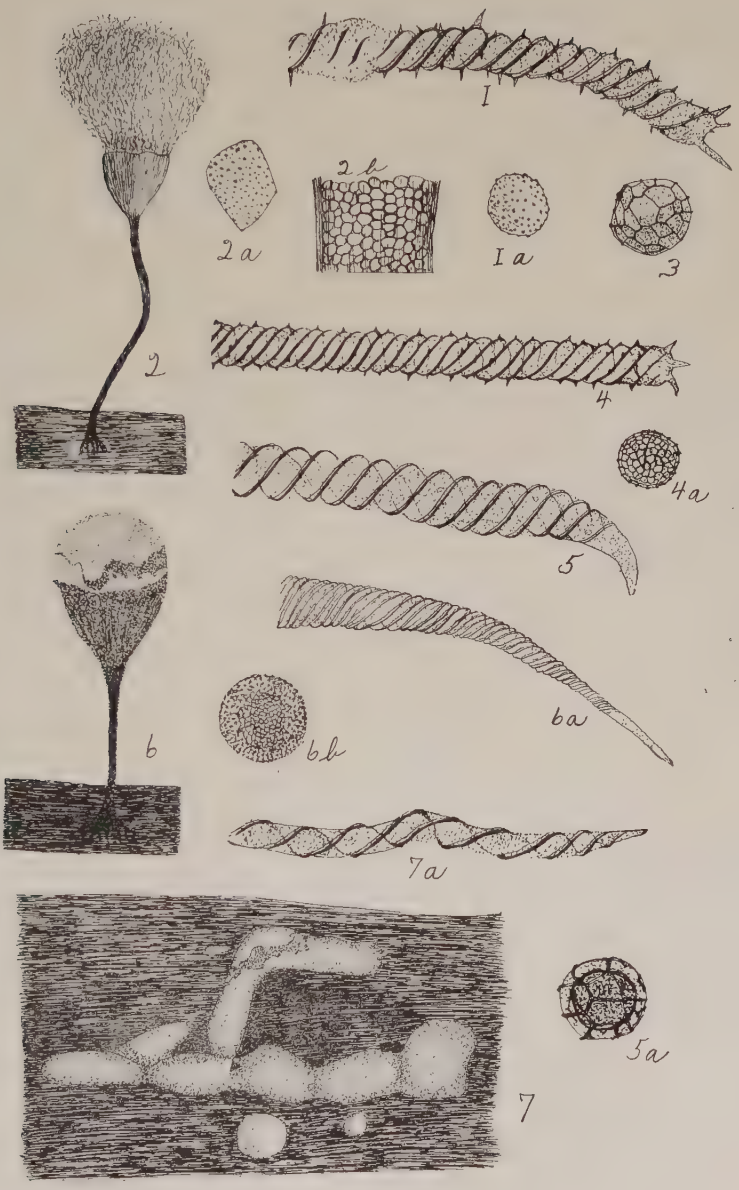
EXPLANATION OF PLATE IX.

Hemitrichia vesparium (Batsch) Macbride.
Fig. 1. Tip of capillitium thread or elater. X 400.
Fig. 1a. A spore. X 800.
Hemitrichia clavata (Pers.) Rost.
Fig. 2. Sporangium with wall broken. Lower portion remains as a cup, capillitium is but little expanded. X 25.
Fig. 2a. Portion of sporangium wall. X 400.
Fig. 2b. Portion of stalk showing hollow filled with spore like cells. X 200.
Hemitrichia serpula (Scop.) Rost
Fig. 3. A spore. X 800.
Trichia scabra Rost.
Fig. 4. Tip of an elater. X 400.
Fig. 4a. A spore. X 800.
Trichia favoginea (Batsch) Pers.
Fig. 5. Tip of an elater. X 400.
Fig. 5a. A spore. X 800.
Trichia decipiens (Pers.) Macbride.
Fig. 6. A sporangium. X 20.
Fig. 6a. Tip of an elater. X 400.
Fig. 6b. A spore. X 800.
Trichia varia Pers.
Fig. 7. A proup of sporangia. X 20.
Fig. 7a. Tip of an elater. X 400.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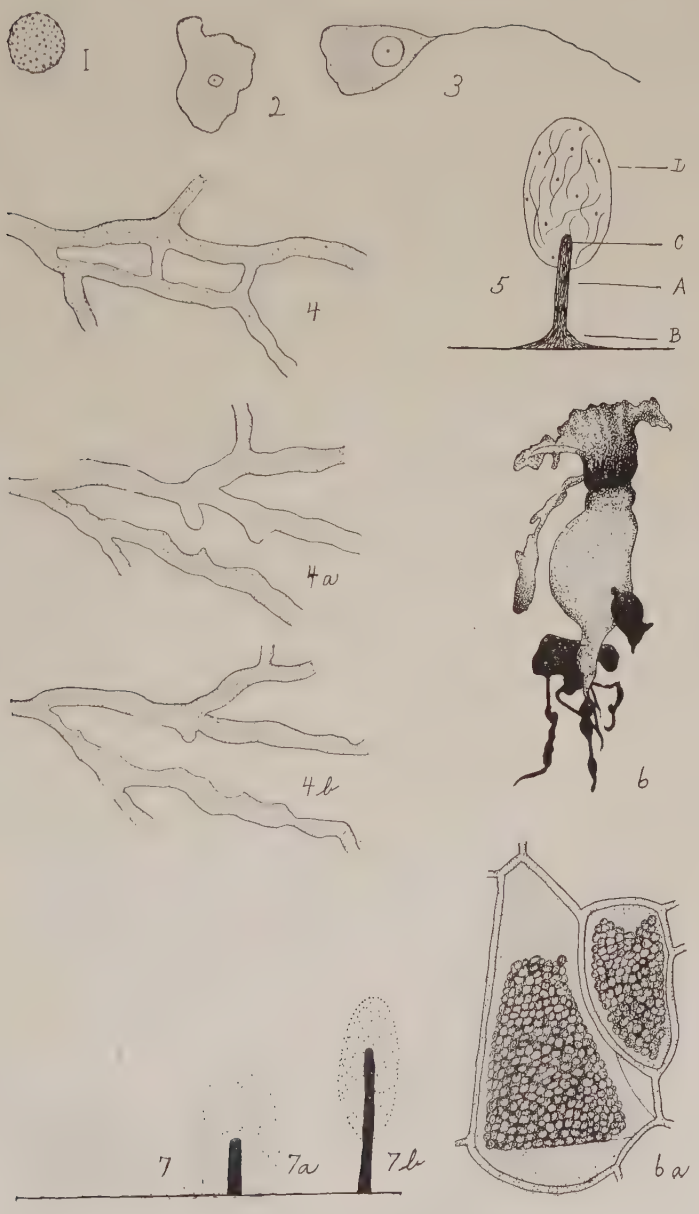
EXPLANATION OF PLATE X.

Fig. 1. Spore of Lycogala epidendrum (L.) Fr.
Fig. 2. Amoeba like swarm spore of same.
Fig. 3. Zoospore showing flagellum.
Figs. 4, 4a, and 4b. A small portion of the plasmodium of Hemitrichia clavata (Pers.) Rost. sketched at intervals of five minutes, showing how rapidly changes in outline are produced by the creeping movement of the plasmodium (X 40).
Fig. 5. Diagrammatic sketch of a sporangium. A, stalk; B, hypothallus; C, columella; D, sporangium wall.
Fig. 6. After Lotsy. Plant attacked by Plasmodiophora brassicae Woronin showing the club root effect.
Fig. 6a. After Lotsy. Cells of the host filled with the spores of P. brassicae Wor.
Fig. 7. Sketch of a mass of cells of Dictyostelium sp. (diagrammatic). In 7a the central cells are forming a stalk upon which the remaining cells creep and form a mass of spores as in 7b.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